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- (54) Security document having a transparent or translucent support and containing interference pigments.
  - Sicherheitsdokument mit einem durchsichtigen oder durchscheinenden Träger und mit dann enthaltenden Interlerenzpigmenten
  - Document de sécurité ayant un support transparent ou translucide et contenant des pigments d'interference
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- (56) References citéd: EP-A- 0 317 514

DE-C- 62 053 GB-A- 202 702 DE-A- 3 810 015 FR-A- 2 429 292 GB-A- 2 035 587

- PATENT ABSTRACTS OF JAPAN vol. 8, no. 210
   (M-328)(1647) 26 September 1984 & JP-A-59 098
- 891 (DAINIPPON INSATSU) 7 June 1984 • PATENT ABSTRACTS OF JAPAN vol. 10, no. 115 (M-474)(2172) 30 April 1986 & JP-A-60 244 588
- (KAZUHIRO NARA) 4 December 1985 PATENT ABSTRACTS OF JAPAN VOL 10, no. 191 (M-495)(2247) 4 July 1986 & JP-A-61 035 985 (DAINICHI SEIKA) 20 February 1986

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## Description

## 1. Field of the Invention

The present invention relates to transparent or translucent security documents that can be verified on their authenticity and are protected against counterfeiting by photo-copying.

## 2. Background of the Invention

Security documents that must be verifiable on their authenticity are e.g. all kinds of identification documents such as passports, visas, jointily cards, view febreses, shad scards, credit cards, scenarity entrance cards, and harber value-documents such as banknotes, shares, borots, certificates, cheques, bottery tickets and all kinds of entrance tickets such as airbanknot includes and valued associations.

Nowadays, by the availability of markedly improved black-and-white and color copiers it becomes more and more easy to copy documents at high quality hardly to distinguish from the originals.

To protect the above mentioned documents against insulutions alterations and reproduction by photo-copying difterent techniques are used such as the melt-laminating or glueing thereto of preprinted plastic overlayers; the printing with special infex; the application of coatings or layers for example loaded with megnetic or fluorescent pigments; coloing or metallizing the substrate of the documents; incorporating holograms; applying fine line printing, watermarks; fib-

ers, security threads, light diffraction marks, liquid crystal marks and/or substances called nacreous, indiscent or interference pigments.

In a particular case disclosed in USP 4\_151.666 light-harmissive pigments serving as diffuse reflectors are spiled by printing to tima verification pattern in a laminated irientification card (I.D. card). The specification of the same USP the use of nacrosus pigments in verification pittlems has been described. Nacrosus pigments, also called consideration of the card of the verification of the verif

same USP- the use of necrooce pigments in vertication patterns has been described. Necroscup pigments, also called peatescern pigments have light refliction characteristics that charge as a nucleon of the verticing or copying angle. The effect of changing color with viewing angle makes that nacrosco pigments repretent a simple and convenient matter to built in a verification feature ascorbidate with a non-copyable optical proper.

Interference projements are in the form of fight-reflecting crystal palaeles of appropriate histoness to produce color by interference. These proments exhibit a color play that verges on indiscence and under a given angle of reflection will allow only the copyring of a single color, whereas other colors appear under different angles of reflection, in other words these pigments show another color to the human eye depending on the observation angle. High nacrecus luster is accompanied by this psecular reflectance.

In most light interference pigments the transmission color is generally the complement of the reflection color.

Observed in transmission, some particular light interference pigments having more pronounced covering aspect is show a particular psych code writed becaved in reflection mode they have a more pronounced color-shift effect due to their specific built up and composition.

Transmission color of light interference pigments is much weaker than reflection color, which color seen in the reflection mode is called hereistate? or one color of the col

In interference, the reflection and transmission colors vary with angle of incidence. The reflection maximum and minimum shift to hower weedengths are the angle of incidence increases (or it as the above mentioned have if inchina) belieful, p. 8. Wariston in color with angle of incidence and observation is referred to as geometric metamerism or porticipation of the colors of th

## 3. Objects and Summary of the Invention

It is an object of the present invention to provide a security document having a transparent or translucent support and containing through the presence on light interference pigments a writingation feature that cannot be occipied by clographic techniques and wherein there is no need for specialized devices or conditions to verify the document on its subtention.

It is a particular object of the present invention to provide a security document having a transparent or translucent support and containing at least one image or pattern in conjunction with interference prigments providing special effects that can not be copied photographically.

It is a special object of the present invention to provide a security document having a transparent or translucent support and comprising a layer including a photographically obtained portrait in conjunction with different light interfer-

ence pigments that allow easy vertication by the naked eye of the security document involved.

Other objects and advantages of the present invention will become clear from the further description, drawings and examples.

In accordance with the present invention there is provided a security document which contains at least one layer and a transparent or translucent support and at least one image or pattern serving for identification purposes, characterized in that said document contains at least one light interference pigment distributed uniformly or patternwise in or on at least one layer of said document and/or contains said pigment in said support.

By Transparent or translucent support" in the document according to the present invention has to be understood a support having a visible light-blocking capacity less than 80 %, preferably less than 50 %, not being excluded supports that are inherently colored or have obtained a color by incorporation of colorants.

## 4. Description of the drawings

Fig. 1 represents a schematic sectional drawing of a security document according to the present invention wherein 15 light interference pigments A are present uniformly in a layer on one side of a transparent support TS and fight interference pigments a different in color with respect to pigments A are present uniformly in a layer on the reside of stadd support and said document contains a photographically obtained image PH in the layer containing said piements A.

Fig. 2 represents a schematic sectional drawing of a security document according to the present invention wherein light interference pigments A air present uniformly on one also of a bransparent support 15 and light interference pigzo ments B different in color with respect to pigments A are present uniformly on the other side of said support, which he pigments A have underneath a pattern printed with "common" light reflecting pigments R having no light interference properties.

Fig. 3 represents a schematic sectional drawing of a security document according to the present invention wherein at one side of a transparent support TS a layer containing light interference pigments A has on top a printed pattern containing common light-reflecting pigments R. At the other side of said support a printed pattern containing said normal pigments R is overprinted with a pattern containing light interference pigments B.

Fig. 4 represents a schematic sectional drawing of a security document according to the present invention wherein patterns containing plat instructions operations operations by the section of present and a containing of a transporent support To are optimized over (1) a patient containing "common" light reflecting pigments IT of which the color is complementary to the color of each pigments. As with the seen whith reflected light, (2) a patient comprising common" light reflecting pigments IT invades the color of each pigments are of the present of the present of prosphorescent dynamics of the present of the present of prosphorescent dynamics of the present of

## Detailed Description of the Invention

A layer and/or pattern containing said fight interference pigments (same or different) may be present at both sides of said transparent or translucent support.

The security document according to the present invention may contain in the same patterns and/or layer mixtures of different light interference pigments.

In a particular embodiment the support itself contains said light interference pigments and is produced e.g. by exhuring a met of a thermoplastic resin having homogeneously distributed therethrough one or more of said light interference pigments, or is produced by coating a resin solution having said pigment(s) dispersed therein followed after coating by the exportation of the solvent(s) used.

An image or pattern present in said document may be formed by printing techniques including non-impact printing techniques and photographic techniques by which is understood herein that a visually inspeciable image has been obtained in said document via a fight-pattern transmitted or reflected by an orienta.

The document of the present invention by the presence of said interference pigments (including mixtures of said pigments) has at least in certain areas a different color when viewed with light transmitted by the document in comparison with light reflected by the document, and has at least in certain areas a different color when viewed in transmission smooti from throit or rear side. These propriets born verification reflectives that cannot be copied with common color copying machines and allow easy verification by the nated eye of the security document involved.

Preferred light interference pigments are titanium dioxide-coated mica or other metal-oxide coated pigments in which the metal oxide has preferably a refractive index comparable with the refractive index of TiO<sub>2</sub>, e.g. 2rO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> or Ci<sub>2</sub>O<sub>3</sub>.

The platelets of metal coole coated mica pigments have three layers in such a way that on each of the broad faces of the mica platelets a very thin coating of metal coole is present.

The more brilliant interference pigments approach metallic basic, an effect that is enhanced by the presence of abcorption colorants. TriO<sub>x</sub>-mice readily lends itself to incorporation of abcorption colorants. Facilic addition (Fig.O<sub>x</sub>) added 5 to the TrO<sub>x</sub> layer, for example imparts a yellow color which in corporation with a yellow interference color creates gold. When Fig.O<sub>x</sub> live unit place of TrO<sub>x</sub> as the coide costing on mics, these pigments have a yellow-red abcorption color because of the inherent color of the Fig.O<sub>x</sub>. They may from bronze to be exposper-end and have a metallic luster.

The preparation of such kind of pigments is described in in the already mentioned bulletin "Nacreous (Pearlescent) Pigments and Interference Pigments", p. 3-4.

Mica pigments serving as a substrate of the interference coatings are a group of hydrous aluminum silicate minerals with pilety morphology and perfect basal (micaceous) dearage. Examples of suitable micas are e.g. muscovite  $KA_{ij}(NS_{ij}C_{ij})$  ( $OH_{ij}$ , philogopite  $K(Mp_{ij}F_{ij})$  ( $NS_{ij}C_{ij}$ ) ( $OH_{ij}$ , biotie K(Fa,Mg) ( $NS_{ij}C_{ij}$ ) ( $NS_{ij}C_{ij}$ ) ( $NS_{ij}C_{ij}$ ) ( $NS_{ij}C_{ij}C_{ij}C_{ij}C_{ij}$ ) ( $NS_{ij}C_{i$ 

Details about the application of metal and/or metal oxide coatings on the mica platelets are further given in US-P 3,007,827,4,434,010 and 5,059,245 and in pubbles of PR-A45 851, EP-A-313 280, DE-A-11 65 182, DE-A-32 37 264, DE-A-32 57 702 and DE-A-38 17 430 and DE-OS 41 41 069.

In a pretented embodiment according to the present invention interference pigments having a composition as described in published German pattert application DE-OS 41 of 698 are used. Said interference pigments, called "Citaropigmenta" according to said DE-OS are composed of discuste platelets contact with either :

A) a first layer of highly refractive metal gode, and

B) a second black layer essentially consisting of metallic iron, molybdenum and/or wolfram, or coated with :

A) a first layer of highly refractive metal goide, and

B) a second black layer essentially consisting of carbon or metal, and

C) a third layer of highly refractive metal goide.

By the presence of a semi-transparent carbon layer said platelets have a high chemical resistance. The carbon layer is obtained by thermal decomposition of corgen-containing hydrocarbon compounds which for each two carbon atoms contain at least one corgen atom e.g. as in carbohydrate setu has sorbhot.

The metal layer B) can be formed in a medium of inert gas from in-gas-phase-decomposable metal compounds, e.g. metal carbonyl compounds, and the metal oxide layers, A) and Q) are formed by decomposition in gas phase of volable metal compounds in the presence of oxygen water vapour or mixtures thereof.

The first layer A) consists e.g. of the oxides of titarium, zirconium, tin and/or iron,

Mea plateles double-side coated with one or more metal oxide layers for use as interierence pigments are commercially available a.g. under the traderance RICOINE (E. Merck, Darmetadl), PLONAU (Remina Oy, Port, Finland), MEARLIN (The Mearl Corporation, New York, U.S.A.) and PRUISCECUEE (REGS, Germany), Under these traderance interierence pigments showing violet, red. green, yellow and blue colors in reflected light at 90° are available on the market.

Holding an interference pigment-coated transperent support at 90° in a white light beam the transmitted light may be greight-yellow to skightly brown which is a totally different color when seen in reflection (the main color). Such effect was seen as well in phytophic Could coarings containing said pigments as in hydrophobic varnisch layers. These differences of color in reflected and transmitted light cannot be photo-ocpied and form an easily detectable verification has the property of the property

Moreover, looking at a coated blue interference pigment layer under different reflection angles the a blue color seen under a reflection angle of 90° will at a reflection angle smaller than 45° turn into yellow, green interference pigments obtain under these circumstances a greyth shade, whereas the violet and red pigments show a brownish-grey hue, in transparancy inspection mode blue interference become brown yellow, magenta interference pigments turn green, and the green once turn magenta.

Preferred interfereince platelet-type pigments for use according to the present invention have a largest surface diameter preferrably between 5 and 200 µm and more preferably 0.25 µm in 0.30 µm. The thickness of the platelet-type interference pigments is preferably between 0.1 µm and 0.5 µm and 0.00 µm perferably between 0.2 µm and 0.4 µm.

In order to obtain special verification effects under ultraviolet Eight exposure the interference pigments can be used in admixture with fluorescent or phosphorescent substances and optical brightening agents.

By vey of example the fight interference pignents A of the above drawings are blue fight interference pignents such as PAUSCEUME fundernam of BASF - Cermany) pignent code EC 1400 which shows when seen in reflection mode a wind blue color. Seen in reflection their color changes in shade by tranging the observation angle. When observed in transmission through said transparent substate said blue pignents change their has and the color becomes complementary to blue. It evides, skightly darkned with a brown stade that is probably due to very reall seconds complementary to blue. It evides, skightly darkned with a brown stade that is probably due to very reall to the probability of the second of the second s impurities. A yellow light interference prigment such as IRIOONE (tradename of MERCK - Germany) prigment code 9331 has when observed in reflection mode a yellow color; seen in transmission the color of that prigment becomes complementary in color, i.e. blue. This is in accordance with the general property of light interference prigments of chandron their color complementarily when changing their mode of viewing going from reflection to bransmission mode.

Tests have been carried out in priming a security pattern on a transparent substrate in such a way that one part of a priming pattern was printed with but high interference pigment (e.g. PLNSCOURSE CE 1408 or DP 1419 or 18APS. Cermany) and another part was printed using a yellow interference pigment (e.g. IPNOOMSE 9231 of MERICK - Gormany). By changing the viewing conditions from transmission to reflection mode the differently printed parts changed their color complementarity, both that less colors became interest, which is as standy been said, an effect that cannot be reproduced photographically by color copying machines. Common xerographic copying machines make printin against a white background the color of the side of the cover of the machine contacting the original is white light reflection. The light interference pigments that lace the light course have high reflectance and show their normal color, whereas the complementary close in reproduced with transmitted light reflectance and sold over.

Said properly provides a strong security feature which makes e.g. that when a yellow light interference pigment to background is surrounding an information pattern printed with a blue light interference pigment pattern a copying machine operating with transmitted light (that is reflected by its white covery will provide a copy that has the printed information in yellow currounded by a blue background which is the complementary in color from what can be seen directly in reflected from tho passion through the document.

Further it has been bound by us that when copying a trunsparred document printed with light interference pigment, and overprinted with a fine guildoor design with common light effection pigment being not light interference pigment, the color of the guildoor pattern in the photocopy is, different whether (f) the copy is made with the front side of the trunsparred document (original) decended lowards the light forcure of the copying machine or (2) the copy is made with the light of said source directed through the rear of the transparent document (lowards the information pattern and image bedrayment at the front side receiving reflected light from the white light reflecting once of the machine.

In the first case said "common" pigments contained in the guilloche pattern are reproduced with their inherent color and the first interference pigments are reproduced in the transmission mode in their complementary colors.

In the second case the photocopying machine does not see in reflected light the pattern of said "common" light reflecting pigments that have been printed on top of the light interference pigments so that they are not reproduced anymore, while the light interference pigments remain copied in their complementary color.

The "common" light reflecting pigments can be printed underneath or above the light interference pigments.

Thus, when in the above combination of information pattern and background a fine guilloche design having a.g. lines 3 nicrors wide, is printed with common yealow colored pigments yealow sight reflecting pigments) being no light interference pigments the differences between the copy and the original will become still more usophean in that the color of the guildoche lines will be reproduced correctly but will not be detectable against the yealow pattern of light interference pigments seen by the copyring machine.

In the embodiment illustrated in Fig. 3 the light reflecting pigments R can show a rainbow effect (are indiscent) wherein one of their rainbow colors has the same hue as the color of the light interference pigments being printed on

In the embodiment fluctated in Fig. 4 the light reflecting colors clowing nairbow effect (often used in security documents) are used in a printing ink containing metallic provider (e.g. aluminium or brocos). Printed underment the light littlerferency pignents the metallic provider being opeaue blocks light and prevents copying of information present on the diverse did on the transpert support. Opacifying tent and back inages may be printed on hip and/or underment the patterns combaining light interference pignents. The printing on both dice of the transperent support may be in prefet forothack registration using a therefor adapted printing machine such as a "Smultan Press" which is known for printing security document.

When the design of the document is arranged in such a way that the light interference pigment pattern does not cover completely the printing pattern of the light reflecting pigments undermealt, the observation in reflective mode shows the light reflecting pigments in their own color on the forut or rear side of the document in the non-covered zone only, in the covered zone the light interference pigments show in reflective mode their main conditions.

On inspection in transmission mode (holding the document to the light) or copying with transmitted light the patterns of common light-reflecting picyments from front and rear side of the document are added (combined) and may tran an uninterrupted area in the field of light interference pigments showing their own complementary color or combination of said complementary colors in overlapping zones, which may result in a continuous gray area where the complementary colors such represent a complementary part of the visible specturum, as in the case as, by the right in congruency as zone containing yellow-reflecting light interference pigments and a zone containing blue-reflecting light interference pigments.

Light interference pigments may be mixed with fluorescent or phosphorescent pigments without blocking the light emitted thereby. Light interference pigments have always some transparency together with their high specular reflectance. According to one embodiment the above mentioned photographically obtained image or pattern is produced by mentioned a black-and-white or clour developed photosersitive silver habbe directly in a light-sensitive material itself or in a non-fight-sensitive image receiving material harding a transparent support.

According to another embodiment the above mentioned photographically obtained image or pattern is produced by 5 means of a non-impact printing teachrique in which analog or digital input signals be controlling the printing of said image or pattern stem from light-information originating from a visible original, which light-information may be transformed into electrical signals that can be transduced and stored, e.g. on magnetic tape or optical disk. The visible original may be an object of which before or an already brand photograph of these.

A survey of non-impact printing techniques such as electro(photo)graphic printing, ink jet printing, photochemical printing and thermal bransfer printing is given by Jerome L. Johnson in "Principles of Non Impact printing" Palatino Press Innic, Calonia U.S.A. (1986).

In accordance with an embodiment according to the present invention there is provided a document including a photographicary obtained image or patient and uniformly distributed interference pigments of a particular obtained seems in the document in combination with a printed patient containing interference pigments of a color different trom is\* the color of the uniformly distributed interference pigments.

In accordance with another embodiment according to the present invention there is provided a document including a photographically obtained image or pattern and having at each side of its transparent or translucent support a layer wherein interference pigments are distributed uniformly, and wherein said layers at opposite sides of said support have a different door by the presence of different interference pigments.

In accordance with a luttler embodiment according to the present invention there is provided a document wherein uniformly distincted interference priments are present in contribution with pattern-rise printed colored common light-reflecting prigments or dyes or white light reflecting priments, e.g. TO<sub>2</sub>. The color of the interference priments under the copying angle in prederably the across as the color of a sign of intelligible absorbting abstances preventing their day successful photocopying of the printed information that remains still readable by the human eye under another observation.

According to still another embodiment in a document of the present invention a pattern of printed interference pigmets is present undermeath anothor on top of a layer or export having a color substantially the same as the color of said pattern containing said interference pigments when seen in reflection or transmission mode.

According to an embodiment in the security document according to the present invention different interference pig-3ments are present uniformly each in a different layer at opposite sides of said support and at least one of said layers has undermeath and/or on top a pattern containing common light-reflecting prigments and/or dyes having no light interference properties, and having preferably a color substantially the same as the color of at least one of the interference prigments where seen in reflection or transmission may.

According to enother embodiment in the security document according to the present invention at least one pattern containing common fight-reflecting pigments and/or dyes is present which pattern is at least parity covered with a pattern containing interference colonents.

According to a further embodiment in the obcournent according to the present invention the support has been coated directly by sputtering with a thin metal code layer or has been coated with said ental code layer on the post a coating or pattern of said light interference pigments and/or coating or pattern of light reflecting pigments having no light interfere ence properties taking one that the thus coated metal code layer has substantially the same or color complementary to the color of each patternisties opplied pigments.

According to a special embodiment the document according to the present invention has on the front and/or rear side of its support underneath and/or on top these of uniformly or patternesse applied intelletence pigments in the form of a printed gallothe line pattern with nairbow effect, containing therefor light reflecting pigments showing that effect on as to have one or more of the nairbow colors the same as the normal or complementary color of ead light intelletence pigments. In a particular case said one or more of the minknow colors is obtained by printing material programs.

another embodiment fluorescent or phosphorescent pigments have been mixed with said light interference pigments and/or with said light reflecting pigments giving said narbow effect to the guilboche pattern or said narbow effect is obtained by printing a transparent vamishhoaded with a fluorescent or phosphorescent pigment.

According to a still Arribe embodiment the document according to the present invention contains (a) bit horsecant pipment(s) that Is (any) mixed with one of said light in relecting pipments and/or mixed with said light interference pipment(s) showld) fight of the difference pipment whereby which is different from the wavelength amage of the colors of said light emilding and interference pipments when these are observed under visible light conditions and the other corresponds with the normal or complete mentary color of said interference pipments.

In a particular embodiment a guilloche pattern with rainbow effect is printed in perfect see through print register on the frunt and rear side of the support, the light reflecting prigments showing nainbow effect printed at one side have complementary color with respect to the prigments printed, but have at one side a color the same as the normal color of said light interference prigments, and wherein parts of said guilloche pattern at either side cover at least party a photograph or printed pattern or complete a printed pattern.

In a particularly interesting embodiment the document according to the present invention contains printed patterns at least partly covering each other and said patterns either and patterns that it is interesting particularly in a construction and composition of which is such that they see all different object when where the seem observation angle, and wherein the printed pattern most remote from the observer has higher covering power than the pattern printed theecen which is more barssparent, hereby obtaining a document that shows in the overlapping pattern area a continuously drapping color shift by changing gradually the observation angle.

A layer containing uniformly distributed light interference pigments may be applied by coating a coating liquid containing early pigments in dispersed form and a dissolved binding agent or containing said pigments dispersed together with a binding agent in the form of a later. After coating the solvent of depending liquid, e.g. water, is removed by evaporation. Any coating technique for the application of thin liquid layers may be used as is known e.g. from the field of the mentalecture of photographic solver halide emission layer materials, e.g. doctor blade coating, gravure roller coating, mentals are coating, as in the coating, description, as in the coating, sold bropper coating and spraying.

According to a special coating technique the light interference pigments are applied in a radiation-curable binder or 15 binder system wherein e.g. monomes act as solvent for polymens or propolymens as described e.g. in published EP-A 0 522 609, or but after coating of the liquid coating composition no solvent has to be evaporated.

In accordance with a particular embodiment unformly distributed interference pigments are applied in a layer that is trunsferred by a stylinging off procedure to built the document of the present invention. Such procedure is described in published EPA of 478 790 but is applied there in to controlling the whitness of an image present on a permanent as support using for the stripping-off and transfer procedure a temporary support costed with a wet-stripping-off and transfer procedure a temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support using the stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure as temporary support costed with a wet-stripping-off and transfer procedure.

According to a special embodiment the light interference pigments are applied in the form of a pigment-transfer foil wherefrom by hot transfer the pigments are transferred uniformly onto the substrate of the security document.

Still another coating technique sailed for uniformly applying said pigments is by dry powder-sizenying optionally on a hot melt presid have wherein they are impregnated by pressure and heat to Author of the pigments an adviserio, a cause are applied to improve achievence to the selected substitute. That substitute may have hydrophilic or hydrophobic surface properties.

Symy-counting may be applied for covering the whole surface of the subdirists or only a part thereof producing Taylin interference intrinov-effects. To justing varying mistance of different interference pinners the interioral you not cover as as made to decrease gradually while an invressing color intensity of another pointent comes up. The human eye will see the mistance effect with control and according to the perception angle and will recognize the basic color of search to the prompt pipments, but a photocopier operating with a fixed copying angle will only reporture, any a simple yellowish-prom color and not the octors of the interference colorments that can be seen under different interpretion and the colors of the interference colorments that can be seen under different interpretion and the colors of the interference colorments that can be seen under different interpretion and the colors of the interference colorments that can be seen under different interpretion and the colors of the interference colorments that can be seen under different interpretion and the colors of the interference colors and the color of the colors of the color of the colors of the colors

The interference pigments can be used for pigmenting a commercial coating varnish which may then be used for proceeding a security document substrate, e.g. opaque reals filten or paper. The coating may proceed with common varnishing or imprognation machinery instead of using printing presses.

As already mentioned herein the uniformly applied interference pigments are advantageously combined with image wise or pattern-wise applied interference pigments of another color.

The image-wise or pattern-wise application of Interference pigments proceeds e.g. by printing with an ink containing said pigments. Suited printing processes are e.g. plandographic offiset printing, growne printing, integlio printing, searces printing, literage printing, literage printing, literage printing, literage printing, literage printing, literage printing from electrophotophophosphic recording materials.

For use in printing on hydrophilic layers or substrates the introcratins for example a 15 to 20 K by weight mixture of the interference playments in a could one of celluloes nitrate in a polyethylene either. Such ink has a good adhierence or 40 hydrophilic coldcil layers such as gelatin-comtaining layers used in DTP-recording materials. Said ink is authantageously applied with a commercial screen press using a polyester screen with a 77 and 55 mesh. The interference colors gradually appear on dying the list.

Thus applied ink patterns on a hydrophilic image-receiving layer for DTR-image production remain unchanged during DTR-processing.

The presence of the light interference pigments in one of the layers of the opaque security document does not affect the possibility to print thereon further graphic or alpha-numerical information by any known printing technique.

For easy visual verification the light interference pigments are present preferably in a security document in a coverage of 0.3 g/m<sup>2</sup> to 10 g/m<sup>2</sup> and more preferably in a coverage between 0.7 g/m<sup>2</sup> and 3 g/m<sup>2</sup>.

The printing of a light interference pigment-containing pattern may proceed on a substrate already covered e.g. by a hologram, light-diffraction pattern, metallic pattern that can be viewed throught the printed pattern so that the properties of the interference pigments are added thereto.

The printing pattern containing interference pigments forms no obstacle for a good adherence with laminated plastic resincus covering material. By proper selection of the binder of the link it can be co-metted with the resin material laminated therefor. According to a pursualize entrodiment the light interference ginemat-containing in its applied on a temporary support, a glooply-time support, wherefrom the ink layer can be shipped off and interelected to permanent support, aca glosel and preprinted substate of a security document. The link layer, applied overall or pattern-wise, after leaving the temporary support covers underlying perinted data on the permanent support. For preventing instudent copying these data have the same color as the interference priment layer when seen under the copying angle, traufficient image contracts is available to on the copying of the pre-printed data is no longer possable. By applying a dirict interference priment-containing ink layer that is translucent the underlying data can be visually inspected therethrough by aftering the necessition and

In accordance with the preceding entrodiment a security document according to the present invention, e.g. serving as ID, card, is perfeately in the time of a laminate in which the information containing lawyed; are scaled between protective resinous sheets. ID, card laminates may be full up as described ag, in ILSP 4,101,701, USP 4,782,759, USP 4,925,930, Daubhind IEPA A04 823 A05, Planimation tamper proof documents are produced which do not allow the opening of the laminates without damaging the image contained therein. The destruction of the scale will knew visual frauch prizes on the security document.

In accordance with a first mixed in the security document according to the present invention a black-and-while phologoph in the time of a silver image is formed by the silver said diffusion insure process, called herein DTR-process. According to taid process discoved silver haldes sall is transferred image receiving layer, called dovedopment nuclei containing layer, for reducing therein transferred gives and said development nuclei containing layer contains itself encilor in an overlaying another an undertaying layer uniformly distributed therein said interference proments.

The light interference pigments may be present either in the image-receiving layer itself and/or in a waterpermeable top layer and/or in a subbing layer covering the support.

The presence of a dried water-impermeable ink pattern on the image-receiving layer blocks DTR-image formation. Thereby it is possible to arrange e.g. fine line patterns such as guiltoches in the photograph creating that way an addiso tonal verification feature.

The principles of the DTP-process are described in U.S. potent No. 2,352,014 of André Rett, issued, June 20, 1944. According to add process other complexes are image-wise transferred by difficient from a sherr halds emulsion layer to an image-receiving layer, where they are converted, in the presence of development nuclei, into a sherr image. For this purpose, an image-wise expected sherr halds emulsion layer the developed by means of an developing cubication in 100 the presence of a so-catellor aller halds estwert. In the exposed parts of the eliver halds emulsion layer the sherr halds emulsion layer the sherr halds expected anything of the eliver halds emulsion layer the when halds is converted into acklete other complexes by means of a sherr halds expected, and easily complexes are transferred by diffusion into an image-receiving layer being in waterpermeable contact with east emulsion layer to form by the catalytic action of add development. As effect or the internal received parts of the sherring layer.

More details on the DTR-process can be found in "Photographic Silver Halide Diffusion Processes" by A. Rott and E. Weyde, Focal Press, London, New York (1972).

In accordance with a second mode in the opaque security document according to the present invention a color photograph in the time of one or more doe images is formed by the dye distinct instanct process (by DTTP-process) wherein the image-wise transfer of dye(s) is controlled by the development of (s) photo-exposed shart halide emulsion layer(s), and wherein dye(s) is (mit) is controlled and in a special image creating layer, called moderal layer, for fixing the dyes, said moderal tayer artifor an overlaying and/or an underlaying layer containing uniformly distributed therethrough said interference pigement.

Dyn diffusion transfer reversal processes are based on the image-wise transfer of diffusible dyn molecules from an image-wise opposed silver holder emulsion meterial to a waterpermeable image-receiving layer containing a modural for the dye(s). The image-wise diffusion of the dye(s) is controlled by the development of one or more image-wise exposed silver halide emulsion layers, that for the production of a multicolv image are differently specially sensitized and contain respectively a relieful magenta and or pad emolecules. A survey of dyn districts in transfer imaging processes has been given by Christian C. Van de Sande in Angew. Chem. - Ed. Engl. 22 (1983) n° 3, 191-209 and a particisor utuarly useful process is described in USP e Ay66,654.

For use in dye diffusion transfer photography the type of modant chosen will depend upon the dye to be micraterial, and divige are to be invitantial, the image-residing layer being a dye-monation (spice contains base) polymers or contains base polymers of unitro-guaration derivatives of virinf methyl testore such as described in US-P 2,882,158, and basic polymers of unitro-guaration derivatives, e.g., poly4-viriplyrition, the metho-platens subplorate of poly2-viriplyrition and similar compounds described in 18P2-2,844,930, and the compounds described in 19P2-2,844,930, and the compounds described in 19P2-2,844,930, and the compounds described in 19P2-2,844,930, and the compounds described in 19P2-2,971,147 and 32,71,146, and despitinely-ammounts or tensing suphoration compounds or tensing suphoration compounds or tensing suphoration compounds or tensing suphoration groups, and the suphoration groups and the suphoration groups and the suphoration groups and the suphoration groups are despitionally deviced in one of the usual shortoxilic bindess in the

image-receiving layer, e.g. in gelatin, polyvinylpytrolidone or partly or completely hydrolysed cellulose esters.

In US-P 4,186,014 cationic polymeric mordants are described that are particularly suited for fixing anionic dyes, e.g. sulphinic acid sait dyes that are image-wise released by a redox-reaction described e.g. in in published EP-A 0.004,399 and US-P 4.224,107.

The DTR process can be utilized for reproducing line originals e.g. printed documents, as well as for reproducing continuous tone originals, e.g. portraits.

By the fact that the DTR-image is based on diffusion transfer of imaging ingredients the image-receiving layer and optionally present covering layer(s) have to be waterpermeable.

The reproduction of black-and-white continuous time images by the DTR-process requires the use of a recording material capable of yielding images with considerable lower gradation than is normally applied in document reproduction for ensure the correct time receiving of continuous times of the original. In document reproduction sixthe halder entailsion materials are used which normally mainly contain silver othoride. Silver chloride not only leads to a more rapid development but also to high contrain.

hr U.S. patent. No. 3,985,561, to be read in conjunction herewith, a light-sensitive saver halide material is described wherein the saver halide is predominantly otheride and this material is capable of forming a confinuous tone image on or in an image-receiving material by the diffusion transfer process.

According to said U.S. patent a continuous tone image is produced by the diffusion transfer process in or on an image-receiving layer through his use of a light-ferentible layer which contains a mixture of silver obtoicle and silver incide and/or silver bromfold deprended in a hydrophile coloid brider as, gledin, wherein the silver briderials present in an amount of all least 90 mole % based on the total mole of silver hadde and wherein the weight ratio of hydrophilic collidate believe friding, expressed as shere mixture, is between 31 and about 10 y weight.

. With these light-sensitive materials successful reproduction of continuous bone images can be obtained probably as a result of the presence of the indicated amounts of silver locifide and/or silver bromide and of the defined high ratio of hardrochilds collect to silver halide.

25 According to U.S. patient No. 4,926,488 (keeks to be read in conjunction herewith, the reproduction of continuous tone images can be improved by developing the photographic material with a miture of developing aperis comparing an orditydroxybexzeria, e.g. catechol, a 3-prozoddinone e.g. a 1-ayr3-5-prozoddinone and orpionaly a p-disybexybexzeria, e.g. thytocylinonis, the moter amount of the orditydrixybexzeria is admiration being larger than the orditydrixybexzeria is admiration being larger than the orditydrixybexzeria is any being present in a molar ratio of at most 5 % with separated or different processing and orditydrixybexzeria.

Suitable development nuclei for use in the above mentioned physical development in the image receiving layer are e.g. nobile metal nuclei e.g. siver, paladium, polst platinum, sulphides, seleridies or leturidies of heavy metals such as PA, Ag, N and CA. Prelevably used development nuclei are oxibidat PdS, Ag,S or nixed aliver-nickesulphide particles. The amount of nuclei used in the image receiving layer is pretenably between 0.02 mg/m² and 10 mg/m².

The image receiving layer comprises for best imaging results the physical development nuclei in the presence of a protective hydrophilic colloid, e.g. gelatin and/or colloidal silica, polyvinyl alcohol etc.

The transfer behaviour of the complexed silver largely depends on the thickness of the image-receiving layer and the kind of binding agent or michare of binding agents used in the nuclei containing layer. In order to obtain a sharp lineage with high spectral density the reduction of the silver sate distillusing into the image receiving per must take plear rapidly before lateral diffusion becomes substantial. An image-receiving material satisfying said purpose is described in ISEP A 883-963.

An image-receiving material of this type is very suitable for use in connection with the present invention and contains a water-impermentale support costed with (1) an image-receiving layer containing physical development nuclei and interference primeris dispersed in a water-permetable binder and (2) a water-permetable big layer free form development and and containing a high chronible collect. In such a we're that :

- (i) the total solids coverage of said two layers (1) and (2) is e.g. at most 2 g/m2,
- (ii) in layer (1) the coverage of the nuclei is in the range of 0.1 mg/m² to 10 mg/m², and the coverage of binder is in the range of 0.4 to 1.5 g/m², and
- (ii) in said top layer (2) the coverage of hydrophilic colloid is in the range of 0.1 to 0.9 g/m<sup>2</sup>.

The coating of said layers proceeds preferably with slide hopper coater or curtain coater known to those skilled in the art.

According to a particular embodiment the nuclei containing layer (1) is present on a nuclei-free underlying hydrophilic colloid underscall layer or underscall layer system having a coverage in the range of 0.1 to 1 julin' of hydrophilic colloid, the total solids coverage of layers (1) and (2) bugsher with the underscall being at most 2 glint's connection with this embodiment the nacrous pigments may be also be included in the underscall layer or may be included therein intested of being reserve in the nuclei containing layer.

The undercoat optionally incorporates substances that improve the image quality, e.g. incorporates a substance

improving the image-tone or the whiteness of the image background. For example, the undercoat may contain a fluorescent substance, silver complexing agent(s) and/or development inhibitor releasing compounds known for improving image sharpness.

According to a special embodiment this image-receiving layer (1) is applied on an undercost playing the role of a
5 timing layer in association with an actic layer serving for the neutralization of alkall of the image-receiving layer. By the
timing layer the time before neutralization occurs is established, at least in part, by the time it takes for the alkaline
processing composition to penetrate through the timing layer. Materials suitable for neutralizing layers and fining layers
are disclosed in Pessenth Disclosura July 1914. Rem 12331 and July 1915, item 13253.

In the image-receiving layer (1) and/or in acid top layer (2) and/or in an alkal-neutration underscap gleidin is used to preferably as hydrophilic cosloid. In layer (1) gleid in present preferably by or all teat (50 %) weight and is cycling used in corpiration with an other hydrophilic colloid, e.g. polyvinyl abchol, cellulose derivatives, preferably calcomymthyl cellulose, docturn, galactomerums, alginic acid referablers, e.g. alginic acid socilium sall cardor westeroslable poly-acrytamides. Sald other hydrophilic cotloid may be used also in the top layer for at most 10 % by weight and in the undecosed in an amount lover than the cellarin content.

The image-receiving layer and/or a hydrophilic colloid layer in water-permeable relationship therewith may comprise a silver halide developing agent and/or silver halide solvent, e.g. sodium thicsubhate in an amount of approximately 0.1 to approximately 4 g per m<sup>2</sup>.

The image-receiving layer or a hydrophilic colloid layer in water-permeable relationship therewith may comprise colloidal silica.

The image-receiving layer may contain as physical development accelerators, in operative contact with the developing nuclei, thicether compounds such as those described a.g. in DE-A-1,124,354; US-P 4,013,471; US-P 4,072,526 and in PP 95500.

According to a preferred embodiment the processing fugula and/or the DTB image-receiving material contains at least one image foring agent. In said case the image foring agent(s) may gradually transfer by diffusion from said 25 image-receiving material into the processing fund and keep therein the concentration of said agents almost teady, in practice such can be realized by using the silver image foring agents in a coverage in the range from 1 mg/m² to 20 mg/m² in a hydrophilic waterpermeable coloid slayer.

A survey of suitable brining agents is given in the above mentioned book of Anch's Rott and Edith Weyda, p. 51-65, preference being given to 17-benyl-Heltzaudo-6-fick, also called 17-benyl-5-mercapto-terazole, bustomeric incoses and derivatives thereof such as 1-(2,3-dimethyl-benyl-6-mercapto-terazole, 1-(3,4-dimethyl-benyl-6-mercapto-terazole, 1-(4-dimethyl-benyl-6-mercapto-terazole, 1-(4-dimethyl-benyl-6-mercapto-terazole, 1-(4-dimethyl-benyl-6-mercapto-terazole, 1-dimethyl-benyl-6-mercapto-terazole, 1-dimethyl-6-mercapto-terazole, 1-dimethyl-6-mercapto-te

In the security documents according to the present invention the transparent or translucent support is e.g. a clear resent film support or such support containing small amounts of primer to voids oppicitying to some degree the support. For example, while TICs, particles as described e.g. in published European patent application (EP-A) 0 324 152 are incomposted therein.

Organic resins suited for manufacturing transparent film supports are e.g. polycarbonates, polyesters, preferably polyethylene terephthalate, polystyrene and homo- and ocpolymers of vinyl chloride. Further are mentioned cellulose esters e.g., cellulose triacetate.

The above mentioned DTR image-receiving materials may be used in conjunction with any type of photosensitive material containing a silver halide emulsion layer. For continuous trans reproduction the silver halide comprises preferse ably a mixture of silver chindric, and silver folder and risker brondic, at least 50 male by sead on the total most the silver halide being silver chindric, and the ratio by weight of flyctophilic colloid to silver halide expressed as silver mixture to be ween 31 and 101.

The binder for the silver halide emulsion layer and other optional layers contained on the imaging element is preentably plastin. But Intend or to repether with geletin, use can he made of one or more other neutral audrors synthesic by hydrophilic colloids, e.g., adhumin; casein, zein, polyvinyl alcohol, algric endos or salth thereof, collabora celerhadress such as cardoxymethyl calludes, modified geletin, e.g., printady geletin et al. The weight alcoh in the salter halide emulsion layer of hydrophilic colloid binder to silver halide expressed as equivalent amount of alver nitrate to binder is e.g. in the mage of 1: 10 to 10; had preferebly for continuous time reproduction is believen a S.s.: and S. 10.

The ather halide emissions may be course or fine guits and can be prepared by any of the well known procedures or e.g. single jet emissions, such els ternations, fishory-manufacture, throughout or throughout procedure or the procedure or throughout procedure or througho

The silver halds particles of the photographic emulsions may have a regular crystalline form such as cubic or octahedral form or they may have a transition form. Regular-psi mentations are described og, in 1, 1 Photog. Sci., Vol. 1, No. 5, Sept.Doc. 1964, pp. 242-251. The alter halds grains may also have an almost opherical form or they may have a babute form (so-called "g-pains), or may have composite crystal forms comprising a mixture of regular and rinegular corposition. Besides having a differently composed one and shell the salver halds grains may comprise also different halds composition. Besides having a differently composed one and shell the salver halds grains may comprise also different halds compositions and metal doparts in behave.

The average size expressed as the average diameter of the silver halide grains may range from 0.2 to 1.2 um, preferably between 0.2 um and 0.8 um, and most preferably between 0.3 um and 0.6 um. The size distribution can be homodepress or heterodispere. A homodisperes size distribution is obtained when 95 % of the grains have a size that does not deviate more than 30 % from the average grain size.

The emissions can be chemically sendifized a.g. by acting subjuve certaining compounds during the chemical ripering stage a.g. ally solitonic portate, ally thiorons, and sodium thiosubphale. Also reducing agents a.g. the tin compounds described in BEA 453,464 and 565,667, and oppositions such as diethylens training or derivatives of animomethane-subphoric acid can be used as chemical sensitizes. Other saltable chemical sensitizes are notic metals and noble metal compounds such as gold, plastums plasticum, intidem, unherinam and rhodium. This method of chemical sensitization has been described in the article of R.KOSLOWSKY, Z. Was. Photogy. Photophys. Photochem. 46, 65-72 (1951).

The emutations can also be sensitized with polyaltytene oxide derindense, a.g., with polyaltytene oxide having a conditional weight of 1000 to 20,000, or with condensation products of allylene oxides and allyhatic alcohols, sylocal, cycle, delyhation products on beninks, allyl-australiated phenols, sighthatic carbonytic acids, sightatic arrives, sighthatic dismines and arrides. The condensation products have a molecular weight of all least 700, prelenably of more than 1000, It is also possible to combine these sensities with each other as described in BEP 527,278 and GBP 727,592.

The sher halide emulsion may be sensitized panchromatically to ensure reproduction of all colors of the visible part of the spectrum or it may be orthochromatically sensitized.

to the speciation in they exhibited an exhibited and be adjusted by proper spectral sensitization by means of the tusual mono- or polymethine byte such as acid or fusic organizes, hemiogranizes, councils, hemicunous, byth offers or others, also in 1- organized methins does e.g. hindoxymnies or necopratines, buth spectral sensitizers have been described by e.g. F.M. HAMER in The Cyarine Dyes and Related Compounds' (1954) Interscience Publishers, John Welf vs. Storn, New York.

The other halide emulsions may contain the usual stabilizers a.g. homopolar or salt-like compounds of mercury with aromatic or heterocyclic rings such as mercaptorisable, simple mercury salts, subjoinium mercury double salts and other mercury compounds. Other suitable establizers are azairdness, personably laters or persistant azairdness, especially those substituted with hydroxy or amino groups. Compounds of this kind have been described by BIRR in Z. Wiss. Photosyth, Photochem 47, 2-27 (1985). Other suitable stabilizers are I.a. heterocyclic mercaptic compounds and phenylmerospherotransols, qualemy bearonisated desirables, and beardings and beargingtication.

A survey of photographic silver halide emulsions and their preparation is given in Research Disclosure December 1989, Item 308119.

Tross, rem 3/9119. Processing of the image-wise expised photographic sheet halide emulsion layer proceeds whilst in contact with an image receiving material according to the invention and is accomplished using an alledine processing liquid having a phy preleasiby between 9 and 13. The pld of the alledine processing liquid having a phy preleasiby between 9 and 13. The pld of the alledine processing liquid having a place substances. Suitable alledine substances are invergence taked in a, sodium hydroxide, potassium carbonate or identaneamisms on mixtures threed. Precessiby used allendamines are teritory abundamines at the limp damberamines. There also accepted the place described in EP-A-937926, EP-A-937926, EP-A-937927, EP-A-939425 and US-P-4,632,596, A combination of allendamines having both, allow or below 9 or a combination of allendamines whereof at less one has a pk, above 9 and another having a pk, of the issue may also be used as decreased in the dependence placed applications laid open to the public murber 7394961, 7395301, 19594161, 21207000, 73950151, 73952051, 19264461, 22954703, 229450353, US-P-A-932811, US-P-A-932811, US-P-A-9586344 etc. The concertaint of the seal allanamines is pathershyly from 0. Thurst 100 to 9 moth.

Suitable developing agents for the exposed other habits are e.g. hydrouginone-type and 1-phenyl-5-pyrazidotostype developing agents as well as p-monomethylaminophenol and derivatives the root. Preferably used is a combristion of a hydrouginone-type and 1-phenyl-5-pyrazidotos-type developing agent wherein the latter is preferably incorporated in one of the layers comprised on the support of the photographic material. A preferred class of 1-phenyl-5-pyrazidotos-type developing agents indication agents is disclosed in the published EPA 445394.

According to a preferred embodiment for continuous bore reproduction a mixture of developing agents comprising an o-dhydroxybersene, e.g. catechd, a 5-yeazolificnore e.g. a 1-anyl-5-yeazolificnore and optionally a p-dhydroxybersene, e.g. hydroxinore the molar amount of the o-dhydroxybersene is said mixture being larger than the moler amount of the 3-yeazolificnore, and the p-dhydroxybersene if any being present in a molar ratio of all most 5.5 whith respect to the o-dhydroxybersene can be used. Other type of developing agents suitable for use in accordance with the present invention are reductiones e.g. according additionally.

## FP 0 657 297 R1

The developing agent or a mixture of developing agents can be present in an alkaline processing solution, in the photographic material or the image receiving material. In case the developing agent or a mixture of developing agents is contained in the photographic material and/or image receiving material, the processing solution can be merely an agreed a development.

In the DTR process the photographic element is developed in the presence of a silver haldle solvent. Preferably used silver haldle solvents are water soluble thiosubphase compounds such as ammonium and column thiosubphase, or ammonium end aliant metal thiocyanates. Other useful aliver haldle solvents (or "completing agents") are described in the book. "The Theory of the Photographic Process" defailed by TH. James, 4th Refiting, a PA-4475 (1977), in particular sulphites and usual. Further interesting silver haldle composing agents are cyclic incides, preferably combined with abandamines, as described in USP + A275,90 and USP + A255,900. a Pomerapsibectoric and detendance as silver halds solvents in USP + A279,1429, preferably combined with alkandamines or with cyclic invides and abandamines. Dislety/methylenediathores can also be used as silver halds solvents.

The saver halde solvent is prelenably present in the processing solution but may also be present in one or more layers comprised on the support of the imaging element and/or receiving material. When the silver haldes solvent is 15 incorporated in the photographic material it may be incorporated as a silver halde solvent precursor as disclosed in e.g., Impanese published unexamined patient applications no. 15247/59 and 27134/563, US-P 4,633,955 and US-P 3,685.991.

The processing subdon for use in the production of black-and-white photographs in security documents according to the present invention may comprise other additives usuble as a, this desert, preservatives, deleteprets a, exchanged to the production of the deservation of the production of the product

The DTR-process is normally carried out at a temperature in the range of 10°C to 35°C.

Further details about the black and white DTR process and also about the dye diffusion transfer process and image receiving materials used therein are described in Research Disclosure November 1976, item 15162,

The present invention will now be illustrated by the following examples without however limiting it thereto. All ratios, percentages and parts are by weight unless otherwise specified.

## EXAMPLE 1

so - Preparation of photographic element for use in the DTR process

A gelatino silver helide emulsion was prepared by slowly running with stirring an equecus solution of 1 mole of silver an expectation of 1 mole of silver intrate 41 g of gelatin, 1.2 mole of sodium chiloride, 0.08 mole of potassium bromide and 0.01 mole of potassium iddie.

The temperature during precipitation and the absequent ripening process tasting three hours was kept at 40°C. Before cooling, shreeding and westigm 24 of op light live even during being one of allow halfs. The weathed models were motion and another 478 of of elegatin were added per mote of silver halfs during the chamical priparing. After ripening 285 of pelastin in the torn of a 20°K appears solving were added to the emission per mote of silver halfs as well as hydroquinone in an amount such that after coating 0.9 of of hydroquinone were present per m² and 1-plentyl-4-d-midtyl-9-groundsformen in an amount such that 0.21°C before of the emission per motion was copied at one of the emission of the emission was copied at one of the emission of the emission was copied and consistent payment of a subthed water-resistant paper support consisting of a paper having a weight off 10°G/m² coated at both sciets with a polythythese estatum at a mot of 20°G/m² per support consisting of a paper having a weight off 10°G/m² coated at both sciets with a polythythese estatum at a mot of 20°G/m² per support.

The emulsion was coated in such a way that an amount of silver equivalent to 1.5 g of silver nitrate was applied per m². The amount of gelatin corresponding therewith is 8.93 g/m² since the gelatin to silver nitrate weight ratio was 5.97.

· Preparation of image receiving material for use in the DTR process and containing light interference pigments

One side of a double-side subbed transparent polyethylene terephthalate support having a thickness of 0.1 mm was coated after corna treatment at a dry coverage of 2.5 g/m<sup>2</sup> of getatin and 1.3 g/m<sup>2</sup> of interterence pigment from the following coating composition:

carboxymethyl cellulose	12 g
gelatin	38.5 g
3 % aqueous dispersion of colloidal Ag <sub>2</sub> S.NiS nuclei	14 ml
4 % aqueous solution of formaldehyde	12 ml
aqueous dispersion of blue PALIOSECURE type EC 1408 (tradename) containing 30 % of said blue pigment and 9 % of gelatin	80 g
12.5 % solution of saponine in ethanol/water (20/80)	20 ml

5 The other side of said support was coated with the above mentioned image-receiving layer coating composition, with the difference however, that the blue interference pigment PALIOSECURE type EC 1408 (tradename) pigment was replaced by yellow interference pigment IRIODINE 9231 (tradename).

Printing of the image receiving material with pattern of graphical and numerical information using a blue non-indiscent
 ink

The printing of said information was carried out in the background area having a yellow color (on observation in reflection mode) due to the presence of said interference pigment IRIODINE 9231 (tradename).

## 25 DTR-image formation

The above defined photographic element was image wise exposed in a reflex camera to obtain therein a photograph (portrait) of the passport owner.

The photo-exposed element was pre-moistened with a processing liquid as defined hereinafter.

The contact time of the photo-exposed element with said fiquid was 6 seconds before being pressed together with the image-receiving material at the blue-pigment side as defined above. The transfer processor employed was a COP-YPROOF (registered trade name of AGFA-GEVAERT N.X) type CP 380. The transfer contact time was 30 seconds. In the image-receiving layer a positive back-and-white (sider image) portrain of the photographed person was obtained.

35 - Composition of the processing liquid:

hydroxyethyl cellulose	1.0 g
Ethylenediaminetetraacetic acid tetrasodium salt	2.0g
Ne <sub>2</sub> SO <sub>3</sub>	45.0 g
Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	14.0 g
KBr	0.5 g
1-Phenyl-5-mercapto-tetrazole	0.1g
1-(3,4-Dichlorophenyl)-1H-tetrazole-5-thicl	0.02 g
N-methyl-ethanolamine	45,0 ml
N-methyl-diethanokumine	30.0 ml
Water up to	11

When viewed in daylight under an angle of 90° in reflection mode the color of the non-printed area around the portrait (aspection at the front side) was the other than the presence of uniformly distributed therein PALIOSECURE type EC 1408 - BLUE (traderame). In the transmission mode the color in that background area became slightly brownish yellow. at the front side and blue at the rear side.

On copying the obtained document with a color copier (CANON CLC 500) the parts of the document around the port were reproduced grey (yellow plus blue) having the blue printed graphical information of non-indiscent pigment with poor contrast thereon.

## FYAMPI F 2

- Preparation of image-receiving element for use in dye diffusion transfer process
- A transparent polyvinyl chloride sheet having a thickness of 0.100 mm was after corona treatment coated at one side with the following compositions for forming a subbing layer and mordanting layer respectively:
  - 1. Subbing layer coating composition

	gelatin	4 g
20	aqueous dispersion of blue PALIOSECURE type EC 1408 (tradename) containing 30 % of said blue pigment and 8 % of gelatin	200 g
	ingredient A 40 % solution dispersed in aqueous medium	250 ml
	5 % solution of siloxane compound in ethanol	125 mi
25	12.5 % solution of saponine in ethanol/water 20/80	20 mi

Ingredient A is a polyester-polyurethane having the same chemical composition as described in US-P 4,902,593, column 2, lines 64-68 and column 3, lines 1-8.

The coating composition was applied coated at a dry coverage of 0.4 g/m² of gelatin and 1.2 g of interference pigment.

2. Coating composition of the mordanting layer

gelatin	20 g
mordant M (20 % solution)	250 ml
saponine (12 %) and wetting agent W (5 %) in water	32 ml
aqueous 4 % solution of formaldehyde	10 mi

Mordant M on the basis of an epoxidized cationic polymer has the same composition as described in US-P 4,902,593, column 7, lines 14-42.

The coating composition was applied at a dry coverage of 0.9 g/m2 of gelatin.

The other side of said support was coated with the above mentioned image-receiving layer coating composition, which we difference however, that the blue interference pigment PALLOSECURE type EC 1408 (tradename) pigment was replaced by yellow interference pigment IR/DOINE 528 (tradename).

The above defined image-receiving material was processed in combination with a photographic dye diffusion transfer material as described in the Europha of U.S. Pat. No. 4,495,65%, which material was exposed to reproduce thereon or a portrait. The exposed material was key for it mixtue in contact with the above defined maper-cessiving material after being led through a diffusion transfer apparatus COPYPFOOF CP 38 (moderane of Agla-Gevaert N.V. Belgium) having in its tray the following basic procession (Eucli C.).

	sodium hydroxide	25 g
	sodium orthophosphate	25 g
	cyclohexane dimethanol	25 g
	2,2' methylpropylpropane diol	25 g
i	N-ethylbenzene-pyridinium chloride	0.5 g
	distilled water up to	1000 ml

After teaving the processing tray the image-receiving sheet was led through a second tray containing an aqueous solution of the already mentioned wetting agent W corresponding with the following formula: iso-nonyi-phenoxy-(CH<sub>2</sub>-CH<sub>2</sub>-QH<sub>2</sub>-H and polassium icide (ref. EP 0250657).

After drying the processed sheet material it was laminated as described in US-P 4,902,593 to obtain a sealed LD, card.

## 20 EXAMPLE 3

The interference pigments mentioned in Example 2 were applied uniformly in front and rear mordanting layers respectively instead of in the subbing layers of an image-receiving material suited for use in a dye diffusion transfer process.

- Preparation of the image-receiving element

A transparent polyvinyl chloride sheet having a thickness of 0,100 mm was after corona treatment coated at one side with the following compositions for forming a subbing layer and mordanting layer respectively:

1. Coating composition of the subbing layer

gelatin	20 g
ingredient A 40 % solution dispersed in aqueous medium	250 ml
5 % solution of siloxane compound in ethanol	. 125 ml
12.5 % solution of saponine in ethanol/water 20/80	20 ml

. The coating composition was applied coated at a dry coverage of 0.4 o/m2 of galatin.

2. Coating composition of the front mordanting layer

gelatin	· 12g
aqueous dispersion of blue PALIOSECURE type EC 1408 (tradename) containing 30 % of sement and 8 % of gelatin	aid blue pig- 100 g
mordant M (20 % solution)	250 ml
saponine (12 %) and wetting agent W (5 %) in water	32 ml
aqueous 4 % solution of formaldehyde	10 mi

## 3. Coating composition of the rear mordanting layer

	gelatin	12 g
10	aqueous dispersion of yellow IRIODINE 9231 (tradename) containing 30 % of yellow pigment and 8 % of gelatin	100 g
	mordant M (20 % solution)	250 ml
	saponine (12 %) and wetting agent W (5 %) in water	32 ml
15	aqueous 4 % solution of formaldehyde	10 ml

The coating composition was applied at a dry coverage of 0.9 g/m<sup>2</sup> of gelatin, and 1.3 g/m<sup>2</sup> of interference pigment.

## EXAMPLE 4

Example 3 was repeated with the difference that the Right interference pigments were explicit uniformly in a gelatin top cost covering the moritaming layer. The dried top cost contained 0.5 g/m²-of gelatin and 1.3 g/m² of interference pigment at each side of the transparent support.

## Claims

- A security document which contains at least one layer and a transparent or franslucent support and at least one
  image or pattern serving for identification purposes, characterized in that said document contains at least one light
  interference pionent distributed uniformly or patternwise in or on at least one layer of said document.
  - 2. Document according to claim 1, wherein said document contains mixtures of different light interference pigments.
- 35 3. Document according to claim 1 or 2, wherein in said document different light interference pigments are present uniformly each in a different layer at opposite sides of said support.
- 4. Document according to claim 1 or 2, wherein in said document different interference pigments are present uniformly each in a different leyer at opposite doctor of said support and talest one of said styers has underenable and/or on top a pattern containing dommon light-reflecting pigments and/or dyes having no light interference properties.
  - Document according to claim 4, wherein said pattern has substantially the same color as the color seen in transmission mode or reflection mode of the light interference pigments combined with said pattern.
- Document according to claim 1 or 2, wherein pattern-wise printed interference pigments are present underneathand/or on log of a pattern containing common light-reflecting pigments and/or dyes having no light interference properties.
- 50 7. Document according to claim 1 or 2, wherein a pattern of printed interference pigments is present underneath and/or on top of a layer or support having a color substantially the same as the color of said pattern containing said interference obtainers when seen in reflection or transmission mode.
- 8. Document according to claim 1 or 2, wherein printed information containing light interference pigments A having, for underneath printed information containing normal light-absorbing and light-relicing pigments R are present at one side of a transparent support TS and at the other side of said support said normal pigments R are printed in a pattern being overprinted at least partly by a pattern containing light interference pigments B.
  - 9. Document according to claim 1 or 2, wherein information containing light interference pigments A at one side of a

transparent support 16 is patternwise prixed over (1) a 'common serior (ight reflecting pigment pattern 16 of which the cools is complementary to the color of cale pigments A mixed with colored flowers and the prixed pigment pattern comprising 'common' light reflecting pigments Hz mixed with colored flowerscent or photoprosecent pigments or dyse. RF, and at the other side of cale stoppingments PSI interestence opigments B are produced for the prixed pigment in the produced over (1) a metallic pigment (alternative to those positions and pigments B are prixed by the p

- 10. Document according to any of the preceding claims, wherein said document contains a photographically obtained image or pattern.
  - 11. Document according to claim 10, wherein said photographically obtained image or pattern is produced by means of developed photoentrible solver halide directly in a light-sensitive material itself or in a non-light-sensitive image receiving material.
  - 12. Document according claim 10, wherein said photographically obtained image or pattern is produced by means of a non-impact printing technique in which analog or digital input signals for controlling said printing stem from photosionals oricinating toma visible oricinal.
  - 13. Document according to claim 10, wherein said photographically produced image or pattern is formed by the silver sait diffusion transfer process in an image-receiving material containing an image receiving layer comprising development nuclei.
- 25 14. Document according to claim 10, wherein said photographically produced image or pattern is formed by a dye deflusion transfer process in an image-receiving material containing a mordant for a dye transferred from an image-wise exposed and developed silver halded enuision material.
- Document according according to any of the preceding claims, wherein said interference pigments are mica platelets coated with a metal code.
  - Document according to claim 15, wherein said metal code is selected from the group consisting of TiO<sub>2</sub>, ZrO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and Cr<sub>2</sub>O<sub>3</sub>.
- 35 17. Document according to claim 15 or 16, wherein said platelets coated with said metal code have a second coating of carbon.
  - Document according to any of claims 15 to 17, wherein said platelets have a largest surface diameter between 5 and 200 

    µm.
  - Document according to any of claims 15 to 18, wherein the thickness of said interference pigments is between 0.1 and 0.6 um.
  - Document according to any of the preceding claims, wherein said light interference pigments are present in said document in a coverage of 0.3 g/m<sup>2</sup> to 10 g/m<sup>2</sup>.
  - 21. Document according to any of the preceding claims, wherein said support has been coated directly by sputtering with a thin metal code layer or has been coated with said metal code layer on top of a coating or pattern of ead light interference precises taking care blank the coating or pattern of bight interference proper said to the precise taking care that the thus coated metal code layer has substantially the same or color complementary to the color of said patternetse applied pignents.
  - 22. Document according to any of the preceding claims, wherein on the front and/or rear side of said support underneath and/or or top of uniformly or patternwise applied interference promests a printed qualitoche line pattern with narihow effects present, containing therefor light reflecting promests showing that effects os as to have one or where of the minbow colors the same as the normal or complementary outs of said fight interference proments.
  - Document according to claim 22, wherein one or more of the rainbow colors is obtained by printing metallic pigments.

- 24. Document according to claim 22, wherein fluorescent or phosphorescent pigments have been mixed with said light interference pigments and/or with said light reflecting pigments giving said rainbow effect to the guilloche pattern.
- Document according to claim 22, wherein said rainbow effect is obtained by printing a transparent varnish loaded with a fluorescent or phosphorescent pigment.
- 28. Document according to claim 22, wherein (a) bi-livorescent pigment(s) is (any) mixed with one of said light reflect-inp pigments where with said light interference pigments whereby when exposed to ultraviolat light said thereoseen pigment(s) abvol(s) light of two different wevelength ranges on of which is different from the wavelength range of the colors of said light reflecting and interference pigments when these are observed under visible light conditions and the other corresponds with the normal or complementary coff of said interference pigments.
- 27. Document according to any of the preceding claims, wherein a galloche pattern with nainbow effect is printed in perfect see-through print register on the front and rear side of said support, and wherein the light reflecting pignents showing michow effect printed at one side here complementary color with respect to the pignents printed, but have at one side a color the same as the normal color of said light interference pigments, and wherein parts of said galloche pattern at either side cover at least partly a photograph or printed pattern or complete a printed pattern.
- 20 28. Document according to any of the preceding claims, wherein said document contains printed patterns at least party covering each other and said patterns each contain (a) different (s) in itereference pigment) he occritation and composition of which is such that they show a different cloic shall when viewed under the same observation angle, and wherein the printed pattern most remote from the observer has higher covering power than the pattern-printed therefore which is more transparent, the dry obtaining a document that shows in the overlapping pattern area as confinuously changing order with by changing gradually the observation angle.
  - Document according to any of the preceding claims, wherein said light interference pigments are contained in said support.
- so 30. Document according to any of the preceding claims, wherein said document is in the form of a laminate.

## Patentansprüche

- Ein Sicherheitsofolument, das werigstens eine Schicht und einen durchschrigen oder durchscheinenden T\u00e4gess
  und wenigstens ein zu Idenfifikationzerweiten dienendes Bild oder Master erth\u00e4lt, dabtuch gekennzeichnet, daß
  das Dokument wenigstens ein gleichm\u00e4\u00e4fig oder musterm\u00e4\u00e4fig in oder auf wenigstens einer Schicht dieses Dokuments verfeiltes Lichtinferfererpignent ernh\u00e4t.
- Dokument nach Anspruch 1, dadurch gekennzeichnet, daß das Dokument Mischungen aus verschiedenen Lichtinterferenzpigmenten enthält.
  - Dokument nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß in diesem Dokument verschiedene Lichtinterferenzpigmente je gleichmäßig in einer unterschiedlichen, an den gegenüberliegenden Seiten des Titigers befindlichen Seitig enthalten auch
- 4. Dolument nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß in diesem Dokument verschiedene Lichtinterforeungignente je gleichnaßig in einer unterschiedlichen, un den gegendberfegereten Selten des Tätigens beihrlichens Schieth einstalten ind und erreigistens ein deuer Schiethen auf deren Unterseite untdieder Oberseite ein Muster mit üblichen Ichterfeleisterenden Pigmenten undfoder Farbstoffen ohne Lichtinterferenzeigenschalten enthalt.
- Dolumient nach Anspruch 4, dadurch gekennzeichnet, daß das Muster wesenflich dieselbe Farbe hat wie die. Farbe, die bei der Durchsicht- oder Aufsichibetrachtung der Lichtinterferenzpigmente in Kombination mit diesem. Ausster bedachtet wird.
- Dokument nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß unter undfoder auf einem Muster mit \( \text{Oblichen} \)
   ibit wellebleierenden Figmenten undfoder Farbstoffen ohne Lichtinterferenzeigerischaften musterm\( \text{all} \)
   ibit der verteilte de

- 7. Dekument nach Anspruch 1 oder 2, dedurch geleentweichnet, daß unter und/oder auf einer Schicht oder einem Tidger ein Auster von gedruckten Interferenzpigmenten enthalten ist, wobei die Schicht bzw. der Tidger bei Durchsicht- oder Aussichtheriarbung wesentlich dieselbe Farbe wie die Farbe des die Interferenzpigmente enthaltenden Masters antweist.
- 8. Dokument nach Ansignuch 1 oder Z. dadurch gekennzeichnet, daß gedruckte Information enthaltende Lichtimterforerungigmente A., unter denen sich gedruckte Information enthaltende, normale, (Erbabsenbierende Uniterteilse): Gererde Pignente R befinden, auf einer Seite eines durchsichtigen Tiligers 13 erhalten ein der dar der anderen. Seite des Tiligers die normalen Pignente R in einem werigsters talweise durch ein Lichtinterferenzpigmente B erhaltende Master überhaltende Master dechnickten Muster oschrickt werden.
- Dokument nach irgendeinem der vorstehenden Ansprüche, darkurch gekennzeichnet, daß das Dokument ein fotografisch erhaltenes Bild oder Muster enthält.
- 11. Dokument nach Anspruch 10, dadurch gekennzeichnet, daß das tolografisch erhaltene Bild oder Muster unter Anwerdung von entwickeltem toloempfindlichem Siberhalogenid direkt in einem Eichtempfindlichen Material seiber oder in einem Echtempfindlichen Bildempfangematerial erzeut wird.
- 39 12. Dokument nach Anspruch 10, dadurch g\u00e9kernzeichnet, da\u00e8 das fotografisch erhaltene B\u00e4d oder Muster durch eine anschlageftele Druckderh\u00e4k, bei er anloge oder dighale, den Druckvorgang, eteuernde Eingangssignale von durch eine sichtbere Vorlage emtilierten Fotosignalen stammen, erzeugt wird.
- 13. Dokumert nach Anspruch 10, dadurch gekennzeichnet, daß das fotografisch erzeugte Bild oder Muster gemäß dem Silbersabdiffisionsübertagungsverlahren in einem Bildemptangsmaterial mit einer Entwicklungskeine enthalterden Bildemptangsschicht erzeugt wird.
- 14. Dokument nach Anspruch 10, daubrin gekennreichnet, daß das fotografisch arzeugle Bild oder Muster entstyrchend einem Flatchslifffischsorischerteriagungsverähren in einem Bildemplangsmatzlist, das ein Belamfür 10 einen von einem bildmäßig belichteten und entwickelten Siberhalogenidernutstonsmateriall übertragenen Flanbstoff enthalt, erhalten wirdt.
  - Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Interferenzpigmente mit einem Metallzoöd überzogene Mikaplatten sind.
  - 16. Dokument nach Anspruch 15, dachurch gekennzeichnet, daß das Metalloxid TiO2, ZrO2, Fe<sub>2</sub>O3 oder Cr<sub>2</sub>O3 ist.
  - Dokument nach Anspruch 15 oder 16, dadurch gekennzeichnet, daß die mit dem Metalloxid überzogenen Platten eine zweite, aus Kohlenstoff bestehende Schicht haben.
  - Dokument nach ingendeinem der Ansprüche 15 bis 17, dadurch gekennzeichnet, daß der Höchstoberflächendurchmesser der Pfatten zwischen 5 und 200 µm liegt.
- Dokument nach irgendeinem der Ansprüche 15 bis 18, dadurch gekennzeichnet, daß die Stärke der Interferenzpigmente zwischen 0,1 und 0,6 µm liegt.
  - Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Lichtinterferenzpigmente in einem Verhältnis zwischen 0,3 g/m² und 10 g/m² im Dokument enthalten sind.

- 21. Dokument nach ingendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Tiliger entweder dret durch Aufstäuben mit einer dünnen Mesläudskrufelt oder oben auf einer Schicht oder einem Muster mit den Eufstinterfererzusignenten undoder den auf einer Schicht oder einem Ausster mit Idheit Beldererden Ergenneten ohne Lichtlinterfererzusignerschaften mit den Mesläudsbehört überzugen ist, wobel darauf geschiet wird, daß die so aufgetagen Mesläudsbehört werden in dem Mesläudsbehört werden in dem Mesläudsbehört werden von der eine damit komplementen Fathe aufweist.
- 22. Dokument nach ingendeinem der vorstehenden Amprothe, datundt geltenzeichnet, daß dich an der Verderssele undder der Brükseln des Täleges unter unsfolder auf gleichmäßig der unsstamfäßig aufgebragenen Interfererzupignersten ein getundles Gallichesthichmaster mit Regendogenefield befinztel, webs dieses Master zum Erhalt dieses Elließte Sichtrelfelderendt, dem Regendogenefields aufweisende Rigmante einfallt, so des eines der mehr Regendogenstreben diesebe Farbe ist bzw. sind wie die normalie oder komplementäre Farbe der Lichtinterfererzeitements.
- 15 23. Dokument nach Anspruch 22, dadurch gekennzeichnet, daß eine oder mehr Regenbogenfarben durch Aufdrucken von Metallbigmenten erhalten werden.
  - Dokument nach Arspruch 22, dedurch gekennzeichnet, daß fluoreszierende oder phosphoreszierende Pigmente mit den Lichtinterferenzpigmenten und\u00fcder den lichtereflektierenden Pigmenten vermischt sind und dem Quillochemuster dadurch den Regenbogenetflett verfelhen.
  - Dokument nach Anspruch 22, dadurch gekennzeichnet, daß der Regenbogeneffekt durch Aufdrucken eines durchsichtigen, mit einem fluoreszierenden oder phosphoreszierenden Pigment geladenen Lacks erhalten wird.
- 23 26. Dolument nach Anspruch 22, dadurch gelennzeichnet, daß (ein) bilthoreszierrede(s) Pigment(s) mit einem der ichtreldeierenden Pigmente undfoder mit den Libitäterferenzeignenten wermischt ist (and), webe des (els) Fluoreszenzpigment(s) bei Belichtung mit Ultravioletlicht Licht von zwei unterschiedlichen Weiterbereichen aufweit (aufweiten), von denen sich einer bei Betrachung unter sichtbarem Licht der kithertelleichen weiter und Lichtbarferenzpigmente vom Welterbereich der Fraben der führtelfeidlierenden Pigmente und Lichtbarferenzpigmente und einzelnichten vom Welterbereich der Fraben der führtelfeidlierenden Pigmente und Lichtbarferenzpigmente unterscheidet und der andere der normalen oder komplementären Frabe der Interferenzpigmente entspricht.
  - 27. Dokument nach Irgendieinen der vorstehenden Ansprüche, dasharb gelenzeichnet, daß ein Gallochenuster mit Reperbogenstelle in peritekten Durchsichstundergeite auf der Vorberstein und Rückeale des Tägers gebruchte wird, die an einer Seite gestruckten, füchtreitließerenden, den Regerbogenefleit aufweisenden Pigmente nien mit der Flätbe der gedundten Pigmente komplements Frabe, dar auf einer Seite eine den commen Flätbe der Lüche interferenzpigmente entsprückende Flätbe aufweisen, und Tälle des Gallochenusters an beiden Seiten werügsters labereit seit ein für der Gallochenuster an beiden Seiten werügsters labereit sein ein führbild vorder vorsichsterfläten.
- 29. Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Lichtinterterenzpigmente im Träger enthalten sind.
- 30. Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß das Dokument in Form eines Laminats vorliegt.

## 65 Revendications

 Un document de sécurité qui contient au moins une couche et un support transparent ou translucide et au moins une image ou moit servant à des fins didetification, caractérisé en ce que ce document contient au moins un pigment d'interférence humineure distribué uniformément ou sous torme de moit dans ou siz au moins une ocuche. de ce document

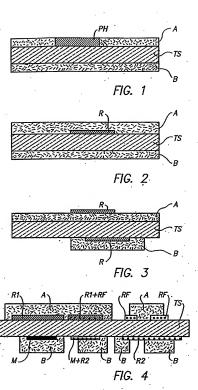
- Document selon la revendication 1, caractérisé en ce qu'il contient des mélanges de différents pigments d'interférence lumineuse
- Document selon la revendication 1 ou 2, caractérisé en ce que dans ce document différents pigments d'interférence lumineuse sont chacun présents de manière uniforme dans une couche différente des côtés opposés du succert.
- 9. Document selon la reventication 1 où 2, caractérisé en on que dans ce document différents pirments d'interférents ent choixan présents de manière uniforme dens une couche différent des chôtics opcessés au suprior une de ces couches a au-dessous selbu sa desseus un motif contenant des pigments el/ou colorants ordinaires réfétérésant la tambrée ne éventos de rovortidés d'interférence burnières.
- 5. Document selon la revendication 4, caractérisé en ce que ce motif a essentiellement la même couleur que la couleur vue en transmission ou en réflexion des pigments d'intentérence lumineuse combinés avec ledit motif.
  - Document selon la revendication 1 ou 2, caractérisé en ce que les pigments d'interférence imprimés sous forme de motif sont présents au-diessous albur au-diessus d'un motif contenant des pigments et/ou colorants ordinaires réfléchéssant la lumière et exempts de procritée d'interférence humineuse.
  - Document selon la revendication 1 ou 2, caractérisé en ce qu'un motif de pigments d'interférence imprimés est présent au-dessous ellou au-dessus d'une couche ou d'un support possédant reseméleament la même coudeur que la couleur dudit motif contenant les pigments d'inferférence lorsquoin of bosenve no réléction ou ou natramission.
  - 8. Document selon la revendication 1 ou 2, caractérisé en ce que de l'information imprimée contenant les pigments d'interférence luminace. A un descous de la quale est imprimée de l'information contenant des pigments ordinaires Raborbant et rélidérisseurs la luminée est présente sur un côté d'un apport transparent TS et sur l'autre côté de ce support lesdis pigments ordinaires R sont imprimés dans un motif qui est surimprimé au moins partiellement par un motif contenant des pigments d'inféréres un la minimique B.
  - 9. Document selon la revendication 1 ou 2, caractérisé en ce que de l'information conternant des pigmènts d'interference lumineuse à our un côté d'un support hamperent 1 set imprinée sous était prinée sous les mois de moitif au dessus (1) d'un motif III de jurginent fordinair effectissant la tumière dont la couleur est complémentaire à la couleur destié pigment à l'originent comprendit de pigment à comprendit de pigment à configure la couleur destié pigment à l'acquire les desserve à la tumière réfléchie, (2) dun moit d'en pigment à l'acquire de turbeccerts ou phosphorescents, et sur l'autre côté dudit support 13 des pigments d'interference B sont imprimés au-dessus (1) dun moit if més pigment més principaires de pigment més pigment més principaires de pigment més pigment més pigment més pigment més pigment més pigment pigm
  - Document esion fune quelconque des revendications précédentes, caractérisé en ce qu'il contient une image ou un motif obtenu(e) per voie photographique.
  - 11. Document selon la revendication 10, caractérisé en ce que cette image ou ce motif obtenu(e) par voie photographique est produit(e) au moyer d'un habogérure d'argent photosensible développé directement dans un matériau sensible à la lumière ou dans un matériau réopteur d'image non-sensible à la lumière.
  - 12. Document selon la revendication 10, caractérisé en ce que cette image ou ce motil obtenu(e) pair voie pholographique est produitjo la moyen d'une technique d'impression sans impact dans laquaté des signaux d'antrée digitaux ou analogues pour cominandre cette impression provinenant de pholosignaux provenant d'un original visible.
- 5 13. Document selon la revendication 10, caractérisé en ce que cette image ou ce motif produit(e) par voie photographique est formé(e) par le procédé de transfert de set d'argent par diffusion dans un matériau récepteur d'image contenant une ocuche réceptipe d'image comprenant des emmes de dévieccement.
  - 14. Document selon la revendication 10, caractérisé en ce que cette image ou ce motif produit(e) par voie photogra-

phique est formé(e) par un procédé de transfert de colorant par diffusion dans un matérieu récepteur d'image contemant un mordant pour un colorant transféré à partir d'un matériau d'émulsion à Thalogérure d'argent exposé et dévelocé sous forme d'image.

- 5 15. Document selon l'une quelconque des revendications précédentes, caractérisé en ce que les pigments d'interférence sont des paillettes mica encluites d'un conde métallique.
  - Document selon la revendication 15, caractérisé en ce que l'oxyde métallique est choisi parmi TiO<sub>2</sub>, ZiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> et Cr<sub>2</sub>O<sub>3</sub>.
  - 17. Document selon la revendication 15 ou 16, caractérisé en ce que les paillettes enduites de l'oxyde métallique sont reconvertes d'une deuxième couche de carbone.
- Document selon l'une quelconque des revendications 15 à 17, caractérisé en ce que les paillettes ont un diamètre de suriace maximal entre 5 et 200 um.
  - Document selon l'une quelconque des revendications 15 à 18, caractérisé en ce que l'épaisseur des pigments d'interférence se situe entre 0.1 et 0.6 um.
- Document selon l'une quelconque des revendications précédentes, caractérisé en ce que les pigments d'interférence lumineuse sont présents dans ce document à raison de 0,3 g/m² à 10 g/m².
  - 21. Document asion Tune quelconque des revenications précédentes, caractérisé en ce que le support a été endatifique ou air été notatifique au discasse d'un endait ou motif desdits pignement d'interférence lumineuré et/ou d'un endait ou motif desdits pignement d'interférence lumineuré et/ou d'un endait ou motif des pignement d'interférence lumineuré et/ou d'un endait ou pusse de projeté des d'interférence lumineux, evillant à ce un public d'autre d'avoir des discasses d'un entre des projetés paus format su motifique ai n'expertisé dement la même couleur ou une couleur complémentain à la calle des d'uneures accountes de suite sous format et de l'un destination à la calle des d'une de l'une d'une d'une
- 20 22. Document seton l'une qualcomque des revendications précidentes, canadériés en ce que sur le troit el/bui le dos ducti support - au-dessous et/ou au-dessous des pigments d'interférence appliqués uniformément ou sous forme de motif - est présent un motif en lignes guillochées avec effet are-pro-clei qui confiere à cette fin des pigments réfléchéssent la hamiète procurant cet effet de sonte qu'une ou plusieurs des couleurs arr-en-del sont lidentiques à la codeur normale ou complémentaire des pigments d'interférence humineuse.
- Document selon la revendication 22, caractérisé en ce qu'un ou plusieurs des couleurs arc-en-ciel sont obtenus en impriment des pigments métalliques.
- 24. Document selon la revendication 22, caractérisé en ce que des pigments fluorescents ou phosphorescents ont été mélangés arec lescrits pigments d'interference lumineuse et/ou avec lescrits pigments réfléchissant la lumière procurant cet été are-en-cit au motif quillocte.
  - Document selon la revendication 22, caractérisé en ce que l'effet arc-en-ciel est obtenu en imprimant un vernis transparent chargé d'un pigment fluorescent ou phosphorescent.
- 8. Document adon la revinduation 22, caracitris en ou qu'un ou plusieurs pignents l'hluorescerts sont misangés avec un éts gjornets réficirisées ent la maitre de lus millangés avec un éts gyoment d'interfecteure burineure, etc) et pignent(s) fluorescentis) montrant lorquir(s) et confi epopent(s) à la burine ut interviolette de la burine de deux domaines de lorquieur d'orde déscruteure et descrute de la proque of confid differents confit in set différent du domaine de lorquieur d'orde des codemns de sette programme de la program d'orde des codemns de la program d'orde programme de la prog
- 77. Document selon Tune quelconque des revendications précidentes, caractérisé en ce qu'un moit guilcohé evec effet an on-ciel est imprimé en partiai registre d'impression transàccie sur le front el le dos dudit support, et caractérisé en ce que les pigments réfléchissant la uniriée présentant l'étit an-on-ciel el imprimés au run côté possident une couleur complémentaire par rapport aux pigments imprimés, mais possiblent au un côté une couleur complémentaire par rapport aux pigments imprimés, mais possiblent au run côté une couleur cientique à la couleur nomaile decidis pigments d'indireférence harmeuse, et caractérisés en ce que des presidents du directives, et caractérisés en ce que des présidents du moit partiellement une photo ou un moit imprimé ou complétent un moit i

## EP 0 657 297 Rt

- 28. Document selon fune quelconque des reverdications préodéertes, caractérisé en ce que ce document contient des moits imprintes au devauteur au moits partieités ent ce daque moit contient un ou plusieurs pignents d'interférence barrinces différents dont le composition sont altes que les popuments présenteire un chargement de couleur d'illérent lorsqu'on les observes cess le même angle d'observation, et caractérisé en ce que le moit imprimé qu'est les plus élégind de l'observation au na pouvoir couvant plus éléves que le moit impriné qu'est les plus familles qu'est qu'est en de l'est plus familles que le moit impriné la de-les sus qu'est plus des plus familles qu'est plus des plus familles que le moit impriné la destau qu'est plus familles qu'est plus familles qu'est plus familles qu'est plus des plus des plus de l'est plus familles qu'est plus des l'est plus familles qu'est plus des plus de l'est plus l'est plus l'est plus de l'est plus les plus l'est plus l'e
- Document selon l'une quelconque des revendications précédentes, caractérisé en ce que les pigments d'interférence lumineuse sont contenu dans ledit support.
- Document selon fune quelconque des revendications précédentes, caractérisé en ce qu'il est sous forme de laminé.



(12)

## NEW EUROPEAN PATENT SPECIFICATION

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- (21) Application number: 93203473.9
- (22) Date of filing: 10,12,1993
- (54) Security document having a transparent or translucent support and containing interference pigments.

Sicherheitsdokument mit einem durchsichtigen oder durchscheinenden Träger und mit darin enthaltenden Interferenzpigmenten

Document de sécurité avant un support transparent ou translucide et contenant des pioments d'interference

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## Description

## 1. Field of the Invention

[0001] The present invention relates to transparent security documents that can be verified on their authenticity and are protected against counterfeiting by photo-copying.

## 2. Background of the Invention

- [0002] Security documents that must be verifiable on their authenticity are o.g. at lixide of identification documents such as passports, views, identify cards, deher if tempers, bank cards, certificated, security entrance cards, and further value-documents such as banknotes, shares, bonds, certificates, cheques, lottery fickets and all kinds of entrance fickets such as airchare folders and mittod season-folders.
- [0003] Nowadays, by the availability of markedly improved black-and-white and color copiers it becomes more and more easy to copy documents at high quality hardly to distinguish from the originals.
- [0042] To protect the above mentioned documents against fraudulent alterations and reproduction by photo-copying different techniques are used such as the melt-laminating or glueing thereto of preprinted plastic overlayers; the printing with special inks; the application of coatings or layers for example loaded with magnetic or fluencecent lygiments; coloring or metallizing the substrate of the documents; incorporating holograms; applying fine line printing, watermarks,
- 10 measturate une subsease un vercontente, vercontente programs, popping une sine priming, waterman, fibers, security threads, [spit direction marks, liquid crystal marks and/or substances caded nacrouse, iridiscent or interference pigments.
  100(6) In a particular case disclosed in US-P 4, 151 (66 light-transmissive pigments serving as diffuse reflectors are
  - power im a plateautic act uscitode in Love 4, 10, belongiare demandable plateautics per service so ways as unuser intercutors are applied by printing to form a verification pattern in a laminated identification card (D. card), in the specification of the same USP; the use of necrosus pigments in verification patterns be been described. Nacrosus pigments, also called perfection characteristics that change as a function of the velwing or copying angle. The effect of charging color with viewing angle makes that necrosus pigments represent a simple and convenient matter to built in a verification feature associated with a non-cooxide colorat property.
- [006] Interference pigments are in the form of light-reflecting crystal platelets of appropriate thickness to produce, colorly hyineference. These pigments abshibl a color by hyineference. These pigments abshibl a color by hyine thickness and under a piven angle influence) will allow only the copying of a single color, whereas other colors appear under different angles of reflection, in other words these pigments show another color to the human give depending on the observation andle, lich in precupe the
- is a occompanied by high specular reflectance.

  [0007] In most light interference pigments the transmission color is generally the complement of the reflection color.

  [0008] Observed in transmission, some particular light interference pigments having more pronounced covering aspects have a particular gray/sh color white observed in reflection mode they have a more pronounced color-shift effect due to their specific built up and composition.
- [0009] Transmission color of light interference pigments is much weaker than reflection color, which color seen in the ornellection mode is called hereinstein formand Tocking (fel Number 2 in a series of Mean Technical Bulletins \*Nazrous (Pasilesceni) Pigments and Interference Pigments by L.M. Greenstein Henry L. Natifi Laboratories Repristed from Pigment Henry Colorobox, Vol. I. Proprieties and Economics; 2nd Edition, Edited by Peter A. Lowis (1989) by permission of
- John Wiley & Sons, Inc. The Mearl Corporation, 41 East 42nd Street, New York, NY, 100017, p. 5 and 5]. [00101] in Interference, the reflection and transmission colors vary with angle of incidence. This reflection maximum and minimum shift to lower wavelengths as the angle of incidence increases feet, the above mentioned Mearl Technical Buildinx, p. 8. Variation in color with angle of incidence and observation is referred to as geometric metamentem or gonic-chromating freel. Amortison, P. M. Color Eng., 5(3), 4247, 54 (1957) and Hermandinger, H. and Johnston R.M.
- \* Gono-caronaesan per, Jonisson, r. w. Coor Eng., 3(5), 4,2-41, 34 (1951) and rientmenunger, rt. and Jonisson R.M. \*A Gonospectrophotometer for Color Measurements\* in Color 69 (M. Richler, ed). Musterschmidt, Göttingen, Germany (1970).

## 3. Objects and Summary of the Invention

- [0011] It is an object of the present invention to provide a security document having a transparent support and conbining priving the presence of light interference priemets are relictation feature that can not be copied by photigraphics tochiniques and wherein there is no need for specialized devices or conditions to verify he document on its authenticity. [0172] It is a particular object of the present invention to provide a security document having a transparent support and containing at least one image or pottern in conjunction with interference pigments providing special effects that can not be coeled rehotorospicicity.
- [0013] It is a special object of the present invention to provide a security document having a transparent support and comprising a layer including a photographically obtained portrait in conjunction with different light interference pigments

that allow easy verifcation by the naked eye of the security document involved.

[0014] Other objects and advantages of the present invention will become clear from the further description, drawings and examples.

- [0015] In accordance with the present invention there is provided a security document as claimed in claim 1.
- [0016] By "transparent support" in the document according to the present invention has to be understood a support having a visable light-blocking capacity less than 50 %, not being excluded supports that have obtained a color by incorporation of ploments.

## 4. Description of the drawings -

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- [9017] Fig. 1 represents a schematic sectional drawing of a security document according to the present invention wherein light interference pigments A are present uniformly in a layer on one side of a transparent support TS and light interference pigments B different in color with respect to pigments A are present uniformly in a layer on the other side of said support and said document contains a photographically obtained image PH in the layer containing said pigments
- [9018] Fig. 2 represents a schematic sectional drawing of a security document according to the present invention wherein light interference pipments A are present multiformly on one side of a transparent support TS and light interference or pipments B different in color with respect to bigments. A are present unknownly on the other side of add support, wherein the pigments A have underneath a pattern printed with "common" light reflecting pigments R having no light interference properties.
- [0019] Fig. 3 represents a schematic sectional drawing of a security document according to the present invention wherein a tone side of a transparent support TS a layer containing ignly interference pigments A has on top a printed pattern containing common light-reflecting pigments R. At the other side of said support a printed pattern containing sold normal pigments R is overprinted with a pattern containing this interference pigments R.
- Sign 2023. Fig. 4 represents a schematic sectional drawing of a security document according to the present trensformer wherein pattern containing fails interference pignents At one side of a temperagent support 15 are printed orly a pattern containing "common" light reflecting pignents Bt of which the color is complementary to the color of said pignents A when seen with reflected [shg. (2) a pattern comprising "common" light reflecting pignents Bt make a second fluorescent or phosphorescent primers for the prosphorescent pignents and (3) patterns containing solely fluorescent or phosphorescent pignents by the prosphorescent pignents and colored fluorescent or phosphorescent pignents by the present of the visible light last end colored fluor them appead to butter light. At the other cise of said support 15 light interference pignents B are printed over (1) an opeque pattern containing metallic pignents (aluminium or bronze falses) Mr. (2) a pattern comprising relating pignents M mided with "contention" light reflecting pignents R2 having a color complementary to the color of said light later ference pignents B when seen with reflected light, and (3) a pattern comprising solely both reflecting pignents R2 having a color complementary to the color of said light later ference pignents B when seen.

## 5. Detailed Description of the Invention

the color of said light interference pigments B when seen with reflected light

- [0021] A layer and/or pattern containing said light interference pigments (same or different) may be present at both sides of said transparent support.
- [0022] The security document according to the present invention may contain in the same patterns and/or layer mixtures of different light interference pigments.
- [0023] In a particular embodiment the support itself contains sald light interference pigments and is produced e.g. by admitting a melt of a themsplastic resin having homogeneously distributed therethrough one or more of said light interference pigments, or is produced by coaling a resin solution having said pigment(s) dispersed therein followed after coaling by the evaporation of the solvent(s) used.
- [9924] An image or pattern present in said document may be formed by printing techniques including non-impact printing techniques and photographic techniques by which is understood herein that a visually inspectable image has been obtained in said document via a fight-pattern transmitted or reflected by an original.
- [0025] The document of the present invertion by the presence of said interference pigments (including mixtures of said pigments) has at least in certain areas a different color when viewed with light transmitted by the document, and has at least in certain areas a different color when viewed in transmission mode from front or rear side. These properties from verification features that cannot be copied with common color copying machines and allow easy verification by the naked very of the security document involved.
- 55 [0026] Preferred light interference pigments are titanium dioxide-coated mica or other metal-oxide coated pigments in which the metal oxide has preferably a refractive index comparable with the refractive index of TiO<sub>2</sub>, e.g. ZiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> or Ci-O<sub>2</sub>.
  - [0027] The platelets of metal oxide coated mica pigments have three layers in such a way that on each of the broad

faces of the mica platelets a very thin coating of metal oxide is present.

[1023] The more britisal interference pigments approach metalic laster, an effect that is enhanced by the presence of absorption colorants. TiO<sub>x</sub> mice readily lends itself to incorporation of absorption colorants. Froir codes (Fe\_O\_O) added to the TiO<sub>O</sub> layer, for example imparts a yellow include in conjunction with a yellow interference color creates gold. When Fe\_O\_O is used in place of TiO<sub>o</sub> as the oxide coating on mice, these pigments have a yellow-red absorption color because of the inherent color of the Fe\_O\_O. They range from throuze to leave proper-red and have a metallic luster. [1023] The preparation of such kind of pigments is described in in the already mentioned builtein Nacrosus (Pearlessen) Pigments and Interference Pigments.)

[D003] Mice pigments serving as a substrate of the interference coatings are a group of hydrous aluminum silicate minerals with platy morphology and perfect basis (infeaceous) dearwage. Examples of suitable mices are e.g. muscoyfile (KUL/(AISA<sub>D-10</sub>) (OH<sub>2</sub>), paragonitre Nau/(AISA<sub>D-10</sub>) (OH<sub>2</sub>), philogopite (K/Mg,File) (AISA<sub>D-10</sub>) (OH<sub>2</sub>), biotite K(Fe,Mg) (AISA<sub>D-10</sub>) (OH), and lepidolite KUL/My<sub>S-24</sub>MA<sub>D-10</sub>Sh<sub>2-3</sub>A<sub>D</sub>(OH) (OH), but the suitable K(Fe,Mg)

[0031] Details about the application of metal and/or metal oxide coatings on the mica platelets are further given in US-P 3,087,827,4,434,010 and 5,059,245 and in published EP-A-45 851, EP-A-313 280, DE-A-11 65 182, DE-A-32 57 024 and DE-A-35 14 1069.

[0022] In a preferred embodiment according to the present invention interference pigments having a composition as described in published German patent application DE-OS 41 41 069 are used. Sald interference pigments, called "Clarzownende" according to said DE-OS are composed of slicate polatelets contend with either:

A) a first layer of highly refractive metal oxide, and

B) a second black layer essentially consisting of metallic iron, molybdenum and/or wolfram, or coated with:

A) a first layer of highly refractive metal oxide, and

B) a second black layer essentially consisting of carbon or metal, and

C) a third layer of highly refractive metal oxide.

[0033] By the presence of a semi-transparent carbon layer said platelets have a high chemical resistance. The carbon layer is obtained by thermal decomposition of oxygen-containing hydrocarbon compounds which for each two carbon atoms contain at least one oxygen atoms que, as in carbohydrates exist as sorbito.

[0034] The metal layer B) can be formed in a medium of hert gas from in-gas-phase-decomposable metal compounds, e.g. metal carboryl compounds, and the metal oxide layers A) and C) are formed by decomposition in gas phase of volatile metal compounds in the presence of oxygen water vapour or mixtures thereof.

[0035] The first layer A) consists e.g. of the oxides of titanium, zirconium, tin and/or iron.

[0035] Mica plateles double-side coated with one or more metal oxide layers for use as interference pigments are commercially evaluable e.g., under the tradenames RIDONE (E. Merck, Damasch), RICNAC (Owint O.), Post, Inland), MEARLIN (The Mearl Corporation, New York, U.S.A.) and PALIOSECURE (BASF, Germany), Under these tradenames interference pigments showing violet, red, green, yellow and blue colors in reflected light at 90° are available on the market.

[0037] Holding an Interference pigment-coaled transparent support at 90° In a white light beam the transmitted light may be groysby-yellow to slightly brown which is a totally different color when seen in milection (the main color). Such effect was seen as well in hydrophilic coiled coatings containing said pigments as in hydrophotic variable layers. These differences of color in reflected and transmitted light cannot be photo-copied and form an easily detectable verification feature.

[0039]. Moreover, looking at a coated bite Interference pigment layer under different reflection angles the a bitu color seen under a reflection angle of 90° will at a reflection angle smaller than 45° from hito yellow, green interference pigments obtain under these dirumstances a greytet shade, whereas the violet and red pigments show a brownish-grey has, in transparency inspection mode that interference become brown yellow, magenta interference pigments um green, and the green ones tim magenta.

[0039] Preferred interference platelet-type pigments for use according to the present invention have a largest surface of diameter preferrably between 5 and 200 µm and more preferably of 25 µm to 30 µm. The thickness of the platelet-type interference pigments is preferably between 0.1 µm and 0.6 µm and more preferably between 0.2 µm and 0.4 µm. [0040] In order to obtain special verification effects under utbandet light exposure the interference pigments can be used in admixture with fluorescent or phosphorescent substances and optical brightening agents.

used in admixture with fluorescent or phosphorescent substances and optical brightening agents.

[0041] By way of example the light interference pigments A of the above drawings are blue light interference pigments.

such as PALIOSECURE (tradename of BASF - Germany) pigment code EC 1408 which shows when seen in reflection mode a whild blue color. Seen in reflection their color changes in stude by changing the observation angle. When observed in transmission through said transparent-substrate said blue pigments change their hue and the color becomes complementary to blue, i.e. yellow, slicitly darkned with a brown shade that is probably due to very small impurities. A yellow light interference pignent such as RIOOINE (tradename of MERCK - Germany) pignent code 9331 has when observed in reflection mote a yellow color; seen in transmission the color of that pignent become complementary in color, i.e. bits. In this is in accordance with the general property of light interference pignents of changing their color complementarity when changing their mode of theiring poliny meritedion be in ternamentary notion. 10042T Tests have been carried out in pristing a security pottern on a transparent subscripts in such a way that one part of a printing pottern was pristed with bits light interference pignent (e.g., PNLDSCENE EC 1406 or FD 1417 of 8645F - Germany). By changing the viewing conditions from transmission to reflection mode the differently printed parts changed their color complementarity, is not the colors became inverted, which is a salracy been as also, an effect that cannot be reproduced photographically by color copying machines. Common xerographic copying machines make prints against a which background the color of the side of the cover of the machine contacting the originals white light reflectance and show their normal color, whereas the "complementary" color is reproduced with transmission than high reflectance and show their normal color, whereas the "complementary" color is reproduced with sensorable dight reflectance and show their normal color,

[0043] Said property provides a strong security feature which makes a.g. that when a yellow light interference pigment background is surrounding an information pattern printed with a bise light interference pigment pattern a copying modified printing with transmitted (pit hat is reflected by its white covery will provide a copy that has the printed information in yellow surrounded by a bise background which is the complementary in color from what can be seen directly in reflected (pit) not passing through the document.

[0044] Further it has been found by us that when copying a transparent document printed with light interference pigments and overprinted with a fine guildock design with common light reflecting pigment being no light interference pigment, the color of the guildoche pattern in the photocopy is different whether (1) the copy is made with the frost side of the transparent document (original) directed towards the light source of the copying machine or (2) the copy is made with the light of said source directed through the rear of the transparent document lowards the information pattern and image background at the front side receiving reflected light from the white light reflecting cover of the machine.

[DMS] In the first case said "common" pigments contained in the gallbothe pattern are reproduced with their inherent color and the light interference pigments are reproduced for the transmission mode in their complementary colors. [DMMS] in the second case the photocopying machine does not see in reflected light the pattern of said "common" light reflecting pigments that have been printed on top of the light histerference pigments so that they are not reproduced anymore, while the light interference pigments remain copied in their complementary color.

[0647] The 'common' light reflecting pigments can be printed underneath or above the light interference pigments. [0648] Thus, when in the above combination of information pattern and background a fine guiltorie design having e.g. line 3 micrors wide, is printed with common yellow cockered pigments (yellow light reflecting pigments) being no light interference pigments the differences between the copy and the original will become still more outspoken in that the color of the guilcode inless will be reproduced correctly but will not be detectable against the yellow pattern of light interference pigments seen by the copyring machine.

[0049] In the embodiment illustrated in Fig. 3 the light reflecting pignents R can show a nainbow effect (are indicent) wherein one of their inshow colors has the sains here as the color of the light hat reference pignents being printed on top, (0950). In the embodiment illustrated in Fig. 4 the light reflecting colors showing rainbow effect (often used in security documents) are used in a printing ink containing metallic powder feet, a suminium or brizzo). Printed undermeath the light interference pignents the medialic powder being oqueue blocks light and prevents copying of information present on the other side of the transparent support. Opacifying front and back images may be printed on top and/or undermeath the patterns containing fight interference pignents. The printing on both sides of the transparent support may be in perfect front/back registration using a therefor adopted printing machine such as a "Simultan Press" which is known for refiniting security documents.

S [0651] When the design of the document is arranged in such a way that the light interference pigment pattern does not cover completely the printing pattern of the light reflecting pigments undermeatly, the observation in reflective mode shows the light reflecting pigments in their own color on the front or rear side of the document in the non-covered zone only, in the covered zone the light interference pigments show in reflective mode their main color.

[0652] On inspection in transmission mode (holding the document to the light) or copying with instrumited light the patterns of common light-fleedding pigments from front and nor adds of the document are added (combined) and may from an uninterrupted area in the field of light listerference pigments showing belt own complementary color or combination of said complementary colors in overlapping zones, which may result in a continuous gray area where the complementary colors each represent a complementary out of the vibiles pectrum, as is the case up. by having in congruency a zone containing yellow-reflecting light interference pigments and a zone containing blow-reflecting light interference pigments.

[0053] Light interference pigments may be mixed with fluorescent or phosphorescent pigments without blocking the light emitted thereby. Light interference pigments have always some transparency together with their high specular reflectance.

- [0054] According to one embodiment the above mentioned photographically obtained image or pattern is produced by means of a black-and-white or colour developed photoeranghe sheer haide directly in a light-sensitive mosterial itself or ha non-flight-sensitive image receiving material harving a transparent support.
- [0055] According to another embodiment the above mentioned photographically idealand image or pattern is produced by means of a non-impact printing leachingue in which analog or digital inpat signals for controlling the period said image or pattern stem from light-information originating from a visible original, which light-information may be transformed into electrical signals that can be transcated and stored, e.g. on magnetic tape or optical disk The visible original may be an object or fiving being or an already formed photograph of these.
- (8055) A survey of non-impact printing techniques such as electro(pholo)graphic printing, ink jet printing, photochemlocal printing and thermal transfer printing is given by Jerome L. Johnson in "Principles of Non Impact printing" Palatino Press - Invince, Calloniau U.S.A. (1986).
  - ress = varie, varience with an embodiment according to the present invention there is provided a document including a photographically obtained image or pattern and uniformly distributed interference pigments of a particular color are present in the document in combination with a printed pattern containing interference pigments of a color different from the color of the uniformly distributed interference pigments.
  - [055] In accordance with another embodiment according to the present invention there is provided a document including a photographically obtained image or pattern and having at each side of its transparent or translucent support a layer wherein Interference pigments are distributed uniformly, and wherein side layers at opposite sides of said support have a different color by the presence of different interference pigments.
- support have a different color by the presence or diserted an electrical present invention there is provided a document (1965). In accordance with a further embodiment according to the present invention there is provided a document wherein uniformly distributed interference pignents are present in combination with pattern-vise printed colored common light-reflicting pignents or does or white light reflecting pignents, e.g., IT-Q.. The color of the interference pignents under the copying angle is preferably the same as the color of said printed light-absorbing substances preventing thereby successful photocopying of the printed information that remains all readable by the human eye under another the prevention of the printed information that remains all readable by the human eye under another the prevention of the printed information that remains all readables of the human eye under another the prevention of the printed information that the prevention of the printed information that the prevention of the printed information that the printed in each of the printed information that the printed in the printed
- 25 observation angle. [1969] According to still another embodiment in a document of the present invention a pattern of printed interference pigments is present underneath and/or on top of a layer or support having a color substantially the same as the color of said pattern containing said interference pigments when seen in reflection or transmission mode.
- or sau poeta: Commission and an annual season in the security document according to the present invention different interference planets are present uniformly each in a different layer at opposite sides of said support and at least one of said layers has undermeth and/or on top a pattern containing common light-reflecting pigments and/or yets having no light interference properties, and having preferably a color substantially the same as the color of at least one of the interference
- pignents when seen in reflection or transmission mode.

  [982] According to another endodiment in the security document according to the present invention at least one
  palem containing common light-reflecting pignents and
- [063] According to a further embodiment in the document according to the present invention the support has been coated directly by spottinting with a thin metal code layer or has been coated with said metal code layer on the coating or pattern or said light interference pigments and/or coating or pattern of light interference properties taking care that the thus coated metal code layer has substantially the same or color complementary to the cool or call aptenterwise applied pigments.
- [0864] According to a special embodiment the document according to the present invention has on the front and/or rear side of its support underneath and/or on top thereof uniformly or patternives applied interference pignerists in the form of a printed pulloche line patient with rais/own effect, containing burselor light interferency pignerist showing that effect so as to have one or more of the raishow colors the same as the normal or complementary color of said light interference pignerists. In a particular case said one or more of the rainbow colors is obtained by printing metallic pignerists.
- [0065] In another embodiment fluorescent or phosphorescent pigments have been mixed with said light interference pigments and/or with said light reflecting pigments giving said nahow effect to the gollicitor pattern or said rainbow effect is obtained by printing a transparent varieth loaded with a fluorescent or phosphorescent pigment.
- [066] According to a still further embodiment the document according to the present invention contains (a) bill-turescent jeyment(t) that is call induced with one of sald light reflecting pignients and/or mixed with said light interference jeyments whereby when exposed to ultraviolat light said fluorescent jeyment(c) show(s) light of two different wavelength ranges one of which is different from the wavelength range of the colors of said light reflecting and interference jeyments when these are observed under visible light conditions and the other corresponds with the normal or complementary
  - color of said interference plyments.

    [0067] In a particular embodiment a guilloche pattern with rainbow effect is printed in perfect see-through print register on the front and rear side of the support; the light reflecting plyments showing rainbow effect printed at one side have

- complementary color with respect to the pigments printed; but have at one side a colorthe same-as the normal color of sald fight interference pigments, and wherein parts of said guilloche pattern at either side cover at least portly a pholograph or printed pattern or complete a printed pattern.
- [0068] In a particularly interesting embodiment the document according to the present invention contains printed patterns at least partly overing each other and said patterns each contain (a) different light interference prigment(s) the construction and composition of which is such that they show a different ofter hit when viewed under the same observation angle, and wherein the printed pattern most remote from the observer has higher covering power than the pattern printed thereon which is more transparent, hereby obtaining a document that shows in the overlapping pattern area a continuously changing color shift by changing gradually the observation angle.
- [0089] A layer containing uniformly destributed light interference pigments may be applied by coating a contain guido containing said pigments in dispersed form and a discovered binding agent or containing said pigments dispersed tospieter with a binding agent in the form of a later. After coating the solvent or dispersing fluid, e.g., water, is removed by evaporation. Any coating technique for the application of this ligidal layers may be used as is known e.g. from the field of the manufacture of pholographic sixthe haldee emulsion layer materials, e.g. doctor battee coating, gravure roler
- sc coating, menicous coating, air intile coating, sidie hopper coating and spraying.
  [0077] According to a special coading lechnique to ligit interference pigments are applied in a radiation-curable binder or binder system wherein a.g. monomers act as solvent for polymens or prepolymens as described a.g. in published EPA O SZ2 698, so that after coating of this figuid coating composition no solvent has to be evaporated.
- [0071] In accordance with a particular embodiment uniformly distributed interference pigments are applied in a layer of that is transferred by a stipping-oil procedure to built the document of the present invention. Such procedure is described in published EPA 0.478 790 but its applied therein for controlling the whiteness of an image present on a permanent support using for the stripping-oil and transfer procedure a temporary support cooled with a well-strippable pron-photosensible buryer containing fluorescent withering agent(s) in a stripping-oil containing the support support cooled with a well-strippable pron-photosensible buryer containing fluorescent withering agent(s) in a stripping-oil cool of the stripping-oil containing agent in t
- [0072] According to a special embodiment the light interference pigments are applied in the form of a pigment-trans-25 fer-foil wherefrom by not transfer the pigments are transferred uniformly onto the substrate of the security document. [0073] SIII another coating technique satied for uniformly applying said pigments by dy powder-spraying optionally on a hot-melt resin layer wherein they are impregnated by pressure and heat. On top of the pigments an adhesive, e. g. wax may be applied to improve adherence to the selected substrate. That substrate may have hydrophilic or hydrophilos control properties.
- 30 [0074] Spray-coating may be applied for covering the whole surface of the substrate or only a part thereof producing "light interference rainbow-effects". By using varying mixture of different interference pigments the intensity of one color cran be made to decrease gradually white an increasing color intensity of another spranet cornes up. The human eye will see the rainbow effect varying according to the perception angle and will recognize the basic color of each the sprayed pigments, but a photopicer porenting with a feet docyping angle will only reproduce, say a single yellowish-
- b trown color and not the colors of the Interference pigments that can be seen under different inspection angles. [0773] The Interference pigments can be used for gimenting a commencial casing variable which may then be used for pre-coating a security document substate. The coating may proceed with common variabiling or impregnation muchinery interested of using printing presesse.
- [0076] As dready meniloned herein the uniformly applied interference pigments are advantageously combined with image-wise or pattern-wise applied interference pigments of another color.
- [0077] The image-vise or pattern-wise application of interference pigments proceeds e.g. by printing with an ink containing said pigments. Suited printing processes are e.g. planographic offset printing, gravure printing, integlio printing, exceep printing, fexcepaphic printing, refer printing, tempon printing, ink, jet printing and toner-transfer printing from electrolybriologiaphic recording materials.
- 45 [0078] For use in printing on hydrophilic layers or substrates the link contains for example a 15 to 20 % by weight induse of the interference pigments in a solution of cellulose nitrate in a polyethylene other. Such link has a good adherence on hydrophilic colotal lyeurs such as called in CITR-recording materials. Said ink is advantageously applied with a commercial screen press using a polyester screen with a 77 and 55 mesh. The Interference colors gradually appear on drying the link.
- 50 [0079] Thus applied ink patterns on a hydrophilic image-receiving layer for DTR-image production remain unchanged during DTR-processing.
  - [0880] The presence of the light interference pigments in one of the layers of the security document does not affect the possibility to print thereon further graphic or alpha-numerical information by any known printing te
- coverage of 0.3 g/m² to 10 g/m² and more preferably in a coverage between 0.7 g/m² and 3 g/m².

  [0082] The printing of a light interference p/gment-containing pattern may proceed on a substrate already covered
  - [0082] The printing of a light interference pigmen-consuming passers may proceed on a substrate arready covered e.g. by a hologram, light-diffraction pattern, metallic pattern that can be viewed throught the printed pattern so that the properties of the interference pigments are added thereto.

[0083] The printed pattern containing interference pigments forms no obstacle for a good adherence with laminated plastic resinous covering material. By proper selection of the binder of the link it can be co-metted with the resin material laminated thereto.

[084] According to a particular embodiment the light interference pigment-containing hick applied on a temporary support, 4,9, polysytene support, wherefrom the hick payer can be shipped off and transferred to a permanent support, e.g., a glued and operatined substants of a security document. The hick layer, applied overall or patient—wise, after leaving the temporary support covers underlying pre-printed data on the permanent support. For preventing fraudulent copying these data have the same color as the interference pigment layer when seem under the copying again. Insufficient langue contrast is available so that copying of the pre-printed data is no longer possible. By applying a dried interference pigment-containing ink layer that is translucent the underlying data can be visually inspected therethrough by altering the perception ande.

[0085] In accordance with the preceding embodiment a security document according to the present invention, e.g., serving as I.D. card, is preferably in the form of a tarninate in which the information-containing byerief) are seeked between protective recinous sheets. I.D. card laministes may be bailt up as described e.g. in ISP 94.101,701, ISP 9.702,739, USP 9.902,539, published EPA 0.348.310 and published EPA 0.462.330. By lamination tamper-proof documents are produced which do not allow the opening of the laminate without dramaging the image contained therein. The destruction of the seal will leave visual fauld to receive on the security document.

[0085] In accordance with a first mode in the security document according to the present invention a black-and-white photograph in the form of a silver image is entered by the silver said difficultor transfer process, calcording to said process dissorbed silver halds sail is transferred imagewise in a special image receiving layer, called development nuclei containing layer, for reducing therein transferred silver sail, said development nuclei containing layer, for reducing therein transferred silver sail, said development nuclei containing layer contains tested and/or in an overtaying and/or an undertaying layer uniformly distributed therein said interference pigments.

[0087] The light interference pigments may be present either in the image-receiving layer itself and/or in a waterpermeable top layer and/or in a subbing layer covering the support.

[0088] The presence of a dried water-impermeable ink pattern on the image-receiving layer blocks DTR-image formation. Thereby it is possible to arrange e.g. fine line patterns such as guilloches in the photograph creating that way an additional verification feature.

[0889] The principles of the DTR-process are described in U.S. potent No. 2,352,014 of Anche Roft, Issued June 20, 1944. According to said process safeve complexes are image-wise transferred by difficult nor an abre hallde emulsion layer to an image-receiving layer, where they are convented, in the presence of development nucels, into a share image. The purpose, an image-rese exposed abver hallde emulsion layer to developed by manner of a developing substrace in the presence of a so-catelot silver halide solvent. In the exposed parts of the sher halide emulsion layer the shere halide is developed to metalic alleve to that it cannot desvion anymore and consequently cannot diffuse. In the non-exposed parts of the shive halide emulsion layer the shiver halide is converted into solible shere complexes by means of a aliver halide complexing parts, cating as silver halides lookenet, and and complexes are transferred by diffusion into an image-receiving layer being in weterpermeable contact with said emulsion layer to form by the catalytic action of said development muck, in so-called physical development, a silver-containing image in the image-receiving layer. (1995)

More details on the DTR-process can be found in Photographic Silver Halide Diffusion Processes\* by A. Rott and E. Weyla, Focal Press, Loncon, New York (1972).

[0091] In accordance with a second mode in the security document according to the present invention a color pholograph in the form of one or more by emisses is formed by the dye difflusion transfer process (dye DTR-process) wherein the image-wise transfer of dye(s) gost post to the development of a phote-opposed six har halds emulsion layer(s), and wherein dye(s) is (are) transferred image-wise in a special image-receiving layer, called mordant layer, for fixing the dyes, said mordant layer and/or an overlaying and/or an underlaying layer containing uniformly distributed therethrough said inferference pipement.

mereinrough said interference pigments.

[0032] Dye diffusion transfer inversal processes are based on the image-wise transfer of diffusible dye inolecules from an image-wise exposed after halde emulsion instelled litric a vertexmeable image-recipit plays containing a mordant for the dye(s). The image-wise diffusion of this dye(s) is controlled by the development of one or more imagewise exposed after halde emulsion layers, that for the production of a multicold rinage are differently spectrally sencitized and contain respectively a yellow, magental and open dyn emolecules. A survive of by diffusion transfer imaging processes has been given by Christian C. Van de Sande in Angew. Chem. - Ed. Engl. 22 (1993) nr 3, 191-209 and a particularly useful process is described in USP 4,496,645.

1983]. For use in dys diffusion transfer photography the type of mordant chosen will depend upon the dys to be mordanted. If acid dyses are to be mordanted, the image-receiving layer being a dys-mordanting layer contains basic polymeric mordants such as polymeric and increased and

- published DEA, 2,009,498 and 2,200,683. Other mordants are long-chain quaternary armonism or phosphonism compounds on them any sulphonism compounds, e.g. those described in USP 2,271,147 and 32/1148, and oxlythmetrylarmonism bromide. Certain metal salts and their hydroxides that form sparingly soluble compounds with the acid dyse may be used too. The dye mordants are dispersed or mediciarily divided in one of the usual hydroyhibib binders in the image-receiving layer, e.g. in galatin, polyvinytymotions or partly or completely hydrolysed cellulose esters.
- [0094] In US-P 4,186,014 cationic polymenic mordants are described that are particularly sulled for fiding anionic dyea, ag. sulphinic acid sait dyes that are image-wise released by a redox-reaction described e.g. in in published EP-A (004,399 and US-P 4,232,107).
- 10 [0095] The DTR process can be utilized for reproducing line originals e.g. printed documents, as well as for reproducing continuous tone originals, e.g. portraits.
  - [0096] By the fact that the DTR-image is based on diffusion transfer of imaging ingredients the image-receiving layer and optionally present covering layer(s) have to be waterpermeable.
  - [9997] The reproduction of black-and-white continuous tone images by the DTR-process requires the use of a recording material capable of yielding images with considerable lower gradation than is normally applied in document reproduction to ensure the correct tone rendering of continuous tones of the original. In document reproduction silver halide emulsion materials are used which normally mainly contain silver chloride. Silver chloride not only leads to a more rand develorement but also by his contrast.
- [0098] In U.S. patent. No. 3,985,561, to be read in conjunction herewith, a light-sensitive silver halide material is described wherein the silver halide is predominantly choride and this material is capable of forming a continuous tone image on or in an image-resching material by the diffusion transfer process.
  - [8899] According to said U.S. patent a continuous tone image is produced by the diffusion transfer process in or on an image-creating layer through the use of a light-censitive layer which contains a mixture of silver chloride and silver chief and creating the thromble dispersed in a hydrophilic colled binder e.g. getalin, wherein the silver chloride is present in an amount of at least 90 mole % based on the total mole of silver haide and wherein the weight ratio of hydrophilic colled to silver haide, expressed as silver nitrate, is between 3:1 and about 10:1 by weight.
- [0100] With these light-sensitive materials successful reproduction of continuous tone images can be obtained probably as a result of the presence of the indicated amounts of silver iodide and/or silver bromide and of the defined high natio of hydrobilitic colloid to silver halide.
- 50 [1011] According to U.S. potent No. 4,242,458 filterwise to be read in conjunction herewith, the reproduction of consumes to make a maps can be improved by developing the photographic manifest with an atheir of developing agents comprising an o-dihydroxyberzere, e.g., catechol, a 3-pyrazofilionoe e.g. a. 1-ay/3-pyrazofilionoe and optionally a p-dihydroxyberzere, e.g. by divoxyberzere, see and individuo being larger to the body consumer of the ordinary development of the surface of the confidence of the confidence of the polydroxyberzere is fairly being present in a motar ratio of all most 25 5 % with respect to the o-differoxyberzerere.
  - [0102] Stillable development nuclei for use in the above mentioned physical development in the image recalving layer are a, no hob michal nuclei a, solven pathedism, odp, falletium, sulphides, selentized or influintion of how you such as Pd, Ag, N and Co. Preferably used development nuclei are obticital PSS, Ag, Sor mixed salver-incites buyloid particles. The amount of nuclei used in the image receiving sayer is preferably between QC upmir\* and 10 mg/m².
- [0103] The image receiving layer comprises for best imaging results the physical development nuclei in the presence of a protective hydrophilic colloid, e.g. gelatin and/or colloidal sitica, polyvinyl alcohol etc..
- [019] The transfer behaviour of the complexed silver largely depends on the lithcress of the image-neckving layer and the kind of binding agent or miture of binding agent sused in the nuclei containing layer. In order to behan a sharp image with high spectral density the reduction of the silver salts diffusing into the image receiving layer must take place rapidly before lateral diffusion becomes substantial. An image-receiving material satisfying said purpose is described in USP 4.885-568.
- [919] An image-reording material of this type is very suitable for use in connection with the present invention and contains a water-impremable support coated with [10] in image-receiving layer containing hybraic development nuclei and interference pigments dispersed in a waterpermeable before and (2) a waterpermeable top layer fires from development nuclei and containing a hybrophic colloid, in such a way that:
  - (i) the total solids coverage of said two layers (1) and (2) is e.g. at most 2 g/m²,
- (ii) In layer (1) the coverage of the nuclei is in the range of 0.1 mg/m² to 10 mg/m², and the coverage of binder is in the range of 0.4 to 1.5 g/m², and
- (iii) In said top layer (2) the coverage of hydrophilic colloid is in the range of 0.1 to 0.9 g/m².
  - [0106] The coating of said layers proceeds preferably with side hopper coater or curtain coater known to those skilled in the art:

- [10197] According to a particular embodiment the nuclei containing layer (1) is present on a nuclei-free underlying hydrophilic colloid undercoal layer or undercoal layer system having a coverage in the range of 1.0 1 of 10th of 10th displail: colloid, the total solds coverage of layers (1) and (2) together with the undercoal being at most 2 of 10th connection with this embodiment the nacrosus proments may be also be included in the undercoal layer or may be included therein histead of being present in the nuclei containing layer.
- [0109] The undercost optionally incorporates substances that improve the image quality, e.g. incorporates a substance improving the image-tone or the whiteness of the image background. For example, the undercost may contain a horsescent substance, silver complexing agent(e) and/or development inhibitor releasing compounds known for improving image sharpness.
- [0109] According to a special embodiment the image-receiving layer (1) is applied on an undercoal playing the role of a timing layer in association with an addict layer serving for the neutrilazation of alkali of the image-receiving layer. By the timing layer the time before neutrilazation occurs is established, at least in part, by the time it lakes for the alkaline processing composition to penetrate through the timing layer. Materials suitable for neutrilazing layers and timina layers are disclosed in Research Disclosure July 1974, item 1233 and July 1975, item 13525.
- [0110] In the image-receiving layer (1) and/or is said top layer (2) and/or in an alkal-neutralizing undercost goalint is used preferabyly are higherolized coloids. In layer (1) gelatin is present perierabyly for all seal 60 % by weight and is optionally used in conjunction with an other hydrophilic coloids, ap, polywiny alcohol, colludose derivatives, preferabyly carboxymethyl colludose, decidary, galiatechamians, sightic add derivatives, e.g. algibire add dentitives, e.g. algibire add endormal methods.
- [0111] The image-receiving layer and/or a hydrophilic colloid layer in water-permeable relationship therewith may comprise a silver halide developing agent and/or silver halide solvent, e.g. sodium blicaulphate in an amount of approximately 0.1 group proximately 4 pper m<sup>2</sup>.
- [0112] The image-receiving layer or a hydrophilic colloid layer in water-permeable relationship therewith may comprise colloidal silica.
- [0113] The image-receiving layer may contain as physical development accelerators, in operative contact with the developing nuclet, thioether compounds such as those described e.g. in DEA-1,124,354; US-P 4,013,471; US-P 4,072,526 and in EP 26520.
- (0114) According to a preferred embodiment the processing liquid and/or the DTR image-receiving material contains as all test one image toning agent. In said case the image toning agent(s) many greadbay transfer by diffusion from said image-receiving material into the processing fugid and keep therein the concentration of each agents almost sleady, in practice such can be realized by using the silver image toning agents in a coverage in the range from 1 mg/m² to 20 mg/m² in a hydrophilic vesterpermeable colloid layer.
- [9115] A survey of suitable loning agents is given in the above mentioned book of Andre Rott and Edith Weyde, p. 6165, preference being given to 1-pheny-fi-Hestizod-6-fibila, also called 1-pheny-fi-Mercapito-Herazioa, Luturomeric structures and derhatives thereof such as 1-(2.3-dimethylphany)-6-mercapito-fibrazioa, 1-(3.4-dimethylphany)-6-mercapito-fibrazioa, 1-(4.4-dimethylphany)-6-mercapito-fibrazioa, 1-(4.4-dimethylphan
  - [0116] In the security documents according to the present invention the transparent support is e.g. a clear resin film support or such support containing small amounts of pigments or voich operalying to some degree the support. For example, white TIO<sub>2</sub> particles as described e.g. in published European palent application (EPA) 0 324 192 are incorported therein.
  - [0117] Organic resins suited for manufacturing transparent film supports are e.g. polycarbonates, polyesters, preferably polyethylene temphilasiate, polyestere and homo- and copolymers of vitryl chloride. Further are mentioned cellulose esters e.g. cellulos affocatel.
- [0118] The above mentioned DTR image-receiving materials may be used in conjunction with any type of photosenoutline material containing a silver haids emulsion layer. For continuous tone reproduction the silver haids
- [0119] The binder for the silver haide emuksion layer and other optional layers contained on the imaging element is in preferably gleitin. But instead of or logether with gelatin, use can he made of one or more other harbard and/or syntheich nythophic codoids, e.g. albumin, casein; zein, polyvinyl alcohol, alginic acids or salts thereof, cellulose derivatives such as carboymethyl cellulose, modified gelatin, e.g. phitadyl gelatin etc. The weight ratio in the sizer haide emulsion layer of hydrophic codied binder to silver haided expressed as equivalent amount of silver nitrate to binder is on.

- g. in the range of 1:1 to 10:1, but preferably for continuous tone reproduction is between 3.5:1 and 6.7:1.
- [0120] The silver habitis enrulsions may be course or fine grain and can be prepared by any of the well known procedures a.g. single jet enrulsions, double jet enrulsions and has be bygmanne enrulsions, environiscal enrulsions, thioparates or thio-ether-ripened emulsions such as those described in US-P 2,222,264, 3,20,066, and 3,271,157. Surface image emulsions may be used or internal image emulsions may be used such as those described in US-P 2,522,250, 3,206,313, and 3,474,257. If desired, mixtures of surface and internal image emulsions may be used as described in
- [0121] The silver halide particles of the photographic enrulshore may have a regular crystalline form such as cubic or octainedral form or they may have a transition form. Regular-grain enrulshors are described e.g. in J. Photogr. Sci., Vol. 12, No. 5, SeyL/Oct. 1964, pp. 242-251. The silver halide grains may also have an almost spherical form or they may have a babular form (sec-called T-grains), or may have composite crystal forms comprising a midcure of regular and fregular crystalline forms. The silver halide grains may have a multilayered structure having a core and shell of different halide composition. Besides having a differently composed one and shell the silver halide grains may comprise also different halide composition, and metal dopastic includes.
- [0122] The everage size expressed as the everage diameter of the silver halfe grahes may range from Oz to 1.2 un, perfeatably between O.Q.m and O.B.m, and other perfeatably between O.Q.m and O.B.m, and O.B.m. The size distribution can be homodisperse or heterodispers. A homodisperse size distribution is obtained when 95 % of the grains have a size that does not deviate more than 30 % from the everage grains size.
- [0123] The emulsions can be chemically sensitized a, by adding sulphus-containing compounds during the cheminal call right right age, and yill obtiogramate, and thorusers, and sodium intesophate. Also recluding agents a, yill be the compounds described in BE-A 493,464 and 588,687, and polyamines such as diethylene triamine or derivatives of aminomethane-sulphonic add can be used as chemical sensitizers. Other suitable chemical sensitizers are noble metals and noble metal compounds such as god, plainum, pelatorum, inform, untherum and rhodium. This method of chemical sensitization has been described in the article of RX/OSLOWSKY, Z. Wiss. Photogr. Photophys. Photochem. 46, 55-72 (1951).
  - [0124] The emulsions can also be sensitized with polyathylene oxide derivatives, e.g., with polyethylene oxide hardways a molecular velopid of 1000 to 20,000, or with condensation products of allylene oxides and adjustic acknowledge, cyclic dehytration products of heatists, asily-substituted phenols, alphalic achrosylic acids, alphalic armines, elighestic armines, and andress. The condensation products have a molecular velopid of all less 070, perfectably of most not 1000, it is also possible to combine these sensitizers with each other as described in BEP-557,278 and 628-P727,98. [125] The shirt halide emulsion may be sensitized pondromatically to ensure reproduction of all colors of the
- Visible part of the spectrum or it may be orthochromátically sensitized.

  [0129] The spectral photocensitivity of the silver haldle can be adjusted by proper spectral sensitization by means of the usual monor- or polymethine dyes such as addict or basic organines, hemicyrenines, oxonols, hemicxonols, stivyl
- of the usual mono- or polymethrise dyes such as addic or basic opanines, herricyanines, oxonols, herniconols, styll dyes or others, also the 7 op/broudest meithine dyes e.g. indicacyanines or necognishes, such spectral sensitizers have been described by e.g. F.M. HAMER in The Cyanine Dyes and Rebited Compounds\* (1964) Interscience Publishers, John Willy & Sons, New York.
- [0127] The silver halids emulsions may contain the ussal etablizers e.g., homopolar or salt-like compounds of more salts with aromatic for heterocyclic fireign such as mercapidistavies, simple mercury salts, suphorium mercury doubtes as an other mercury compounds. Other saltable stabilizers are azaindenes, preferably letra- or penta-azaindenes, especially those assistanted with hydroxy or amino groups. Compounds of this find have been described by BRIR in Z. Wiss. Photogr. Photoghys. Photochem. 47, 227 (1952). Other saltable stabilizers are a.s. heterocycle mercapto compounds a.g. phenymercaptotextucyle, quaternary berenditaized derivatives, and bencruistavies, and serviciatives.
- [0128] A survey of photographic silver halide emulsions and their preparation is given in Research Disclosure December 1989, item 308119.
  - [0129] Processing of the image-wise exposed photographic salver hadde emulsion layer proceeds whilst he conflicted with an image receiving material according to the invention and he accompliated using an alkaline processing layed having a pH preferably between 9 and 13. The pH of the alkaline processing layed may be established using various alkaline substances are uniquarie shall as excluding postage and an employed called a period of the processing layed may be established using various or alkanolamines or mitures thereof. Preferably used districtances are tertiary alkanolamines e.g., those described in PH-A-937926, PH-
  - [0130] Suitable developing agents for the exposed silver halide are e.g. hydroquinone-type and 1-phenyl3-sypraculidone-type developing agents as well as p-monomethylaminophenol and derivatives thereof. Preferably used is a combination of a hydroquinone-type and 1-phenyl3-sypraculidone-type developing agent wherein the latter is preferably.

- incorporated in one of the layers comprised on the support of the photographic material. A preferred class of 1-phenyl-3-pyrazolitione-type developing agents is disclosed in the published EP-A 449340.
- [153] According to a preferred embodiment for confinuous tone reproduction a mixture of developing agents composing an o-dihydroxybenzene, a.g. catachol, a 3-pyrazofidinone a.g. a 1-anyl-3-pyrazofidinone and optionally a pdihydroxybenzene, a.g. hydroxybenzene the molar amount of the o-dihydroxybenzene in said mixture being larger than the molar amount of the 3-pyrazofidinone, and the p-dihydroxybenzene if any being present in a molar ratio of al most 5.% with respect to the o-dihydroxybenzene cambe used. Other type of developing agents suitable for use in accordance with the present invention are reductiones a.g. ascorbe acid derivatives.
- wan no present measures are recommended to the developing agents can be present in an alkaline processing solution, in the photographic material or the image receiving material, in case the developing agent or a mixture of developing agent is contained in the photographic material and/or mage receiving material, the processing solution can be merely an agency addition estudies that initiates and activates the development.
  - an argumos amount 3 was the control of the control
  - allanokamines, Dialsyhnethylenedisulfones can aloo be used as silver halde solvent.

    [1014] The silver halde solvent is preferably present in the processing solution but may also be present in one or more layers compreted on the support of the imaging element and/or receiving material. When the silver haldes solvent is incorporated in the photographic material it may be incorporated as a silver halde solvent procusors as disclosed in incorporated of the photographic material it may be incorporated as a silver halde solvent procusors as disclosed in Sept. Japanese published unexamined paint applications no. 1524/1759 and 27154/1830, USP-4,893,955 and US-P
  - 3,000,000 Till Till processing solution for use in the production of black-and-while pholographs in security documents according to the present invention may compile other additives such as e.g. bicknowns, preservatives, detergories acsolyterio believements such as SURFOND. (19, SURFOND. 455, SURFOND. 440 etc. all available from Air Reduction
- acetylenic detergents such as SURFYNOL 104, SURFYNOL 455, SURFYNOL 440 etc. all available from Air Red Chemical Company, New York. [0136] The DITR-process is normally carried out at a temperature in the range of 10°C to 35°C.
- [0137] Further details about the black-and-white DTR process and also about the dye diffusion transfer process and image receiving materials used therein are described in Research Disclosure November 1976, item 15162. [1

# EXAMPLE 1

- Preparation of photographic element for use in the DTR process

ratios, percentages and parts are by weight unless otherwise specified.

- [0139] A gelatino silver halide emulsion was prepared by slowly running with stirring an aqueous solution of 1 mole of silver nitrate per liter into a gelatine solution containing per mole of silver nitrate 41 g of gelatin, 1.2 mole of sodium childride, 0.08 mole of potassitum bronified and 0.01 mole of potassitum foldibe.
- [0140] The temperature during precipitation and the subsequent ripening process lasting three hours was kept at 40°C.
- (914) Before cooling, shredding and vashing 214 g of gelatin were added per mole of silver halide. The wesheld nocidies were motile and another 476 g of gelatin were added per mole of sherr halides during the chemical ripode Alter riponing 285 g of gelatin in the form of a 20 % supercus solution were added to the emulsion per mole of alher halides as well as hydrogulance in an amount such that after coating 0.9 g oil productione were present per n<sup>2</sup> and 1-hepsny4-4-freemhy4-9-prazolitone in an amount such that 0.21 g thereof were present per n<sup>2</sup>. The emulsion was coated at one side of a subbed water-resistant paper support consisting of a paper having a weight of 110 gim² coated at both sides with a polystylene estatum at a nitio of 20 gim² per side.
  - [0142] The emulsion was coated in such a way that an amount of silver equivalent to 1.5 g of silver nitrate was applied per m<sup>2</sup>. The amount of gelatin corresponding therewith is 0.93 g/m<sup>2</sup> since the gelatin to silver nitrate weight ratio was 5.91.
  - Preparation of image receiving material for use in the DTR process and containing light interference pigments
  - [0143] One side of a double-side subbed transparent polyethylene terephthalate support having a thickness of 0.1

mm was coated after corona treatment at a dry coverage of 2.5 g/m<sup>2</sup> of getatin and 1.3 g/m<sup>2</sup> of interference pigment from the following coaling composition:

	carboxymethyl cellulose	12 g
5	gelatin ·	38.5 g
	3 % aqueous dispersion of colloidal Ag <sub>2</sub> S.NIS nuclei	14 ml
	4 % aqueous solution of formaldehyde	12 ml
	aqueous dispersion of blue PALIOSECURE type EC 1408 (tradename) containing 30 % of said blue	80 g
0	pigment and 8 % of gelatin	
•	12.5 % solution of saponine in ethanol/water (20/80)	20 ml

[9144] The other side of said support was coaled with the above mentioned image-receiving layer coating composition, with the difference however, that the blue interference pigment PALIOSECURE type EC 1408 (tradename) pigment was replaced by vellow interference pigment [RIQDINE 292] (tradename).

- Printing of the image receiving material with pattern of graphical and numerical information using a blue non-iridiscent ink

10145] The printing of said information was carried out in the background area having a yellow color (on observation in reflection mode) due to the presence of said interference pigment IRIODINE 9231 (tradename).

DTR-image formation

- 5 [0146] The above defined photographic element was image-wise exposed in a reflex camera to obtain therein a photograph (portrait) of the passport owner.
  - [0147] The photo-exposed element was pre-moistened with a processing liquid as defined hereinafter.
- [0148] The contact time of the photo-exposed element with said figuld was 6 seconds before being pressed logether with the image-receiving material at the bite-ipjerinent side as defined above. In the stander processor employed was a COPYPROOF (registered trade name of AGPA-GEVAERT NJ) type CP 380. The transfer contact time was 30 seconds. In the image-receiving layer a positive black-and-white (silver image) portrait of the photographed person was obtained.
- Composition of the processing liquid: .

#### 101491

hydroxyethyl cellulose	1.0 g
Ethyl enedlaminetetraacetic acid tetrasodium salt	2.0 g
Na <sub>2</sub> SO <sub>3</sub>	45.0 g
Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	14.0 g
KBr .	0.5 g
1-Phenyl-5-mercapto-tetrazole	0.19
1-(3,4-Dichlorophenyl)-1H-tetrazole-5-thiol	0.02 g
N-methyl-ethanolamine ·	45.0 ml
N-methyl-diethanolamine .	30.0 ml
Water up to	.11

- [0150] When viewed in daylight under an angle of 90° in reflection mode the color of the non-printed area around the portnat (inspection at the front stide) was blue due the presence of uniformly distributed therein PALIOSECURE type EC 1908 BLUE (insternanc). In the transmission mode the color in that background area became slightly brownish yellow at the front stide and blue at the print stide.
- [0151] On copying the obtained document with a color copier (CANON CLC 500) the parts of the document around the portrait were reproduced grey (yellow plus blue) having the blue printed graphical information of non-iridiscent plement with poor contrast thereon.

## EXAMPLE 2

- Preparation of image-receiving element for use in dye diffusion transfer process
- [0152] A transparent polyvinyl chloride sheet having a thickness of 0.100 mm was after corona treatment coaled at one side with the following compositions for forming a subbling layer and mordanting layer respectively:
  - 1. Subbing layer coating composition
- 10 101531

	gelatin aqueous dispersion of blue PALIOSECURE type EC 1408 (tradename) containing 30 % of said blue ploment and 8 % of celatin	4 g 200 g
15	Ingredient A 40 % solution dispersed in aqueous medium	250 ml
	5 % solution of siloxane compound in ethanol	125 ml
	12.5 % solution of saponine in ethanol/water 20/80	20 mJ

- 25 2. Coating composition of the mordanting layer

## (0156)

gelatin.	20 g
mordant M (20 % solution)	250 ml
saponine (12 %) and wetting agent W (5 %) in water	32 mi
aqueous 4 % solution of formaldehyde	10 ml

- [0157] Mordant M on the basis of an epoxidized cationic polymer has the same composition as described in US-P 4,902,593, column 7, lines 14-42.
  - [0158] The coating composition was applied at a dry coverage of 0.9 g/m² of gelatin.
  - [0159] The other side of said support was coated with the above mentioned image-receiving layer coating composition. The other side of said support was coated with the above mentioned image-receiving layer coating composition, with the difference however, that the blue interference pigment IRIODNES 231 (tradename) and the properties of the properti
- (9169) The above defined image-receiving material was processed in combination with a photographic dye diffusion transfer material as described in the Example of U.S. Pat. No. 4,495,845, which material was exposed to reproduce thereon a portal. The exposed material was kept for influide in constant this below defined image-receiving material after being led through a diffusion transfer apparatus COPYPROF CP 38 (tradename of Agla-Gevaert N.V. Belpium) handning his by the Hodwing basic processor found?

sodium hydroxide	25 g
sodium orthophosphate	25 g
cyclohexane dimethanol .	25 g
2,2' methylpropylpropane diol	25.a
N-ethylbenzene-pyridinium chloride	0.50
distilled water up to	1000 ml

- . [0161] After leaving the processing tray the image-receiving sheet was led through a second tray containing an saqueous solution of the already mentioned wetting agent W corresponding with the following formula: iso-nony-phe-noxy-(CH<sub>2</sub>-P<sub>2</sub>O<sub>3</sub>)<sub>2</sub>+1 and polassation folder (LE D 0250537).
  - [0162] After drying the processed sheet material it was laminated as described in US-P 4,902,593 to obtain a sealed

I.D. card.

## **EXAMPLE 3**

- [0163] The Interference pigments mentioned in Example 2 were applied uniformly in front and rear mordanting layers respectively instead of in the subbing layers of an image-receiving material suited for use in a dye diffusion transfer process.
  - Preparation of the image-receiving element
  - [0164] A transparent polyvinyl chloride sheet having a thickness of 0.100 mm was after corona treatment coated at one side with the following compositions for forming a subbing layer and mordanting layer respectively
  - 1. Coating composition of the subbing layer

#### [0165]

gelatin	20 g
Ingredient A 40 % solution dispersed in aqueous medium	250 ml
5 % solution of siloxane compound in ethanol	125 ml
12.5 % solution of saponine in ethanol/water 20/80	20 ml

- [0165] The coating composition was applied coated at a dry coverage of 0.4 g/m<sup>2</sup> of getatin.
- 2. Coating composition of the front mordanting layer

## [0167]

30	gelatin	12 g	l
	aqueous dispersion of blue PALIOSECURE type EC 1408 (tradename) containing 30 % of said blue	100 g	l
	pigment and 8 % of gelatin		l
	mordant M (20 % solution)	250 ml	l
	saponine (12 %) and wetting agent W (5 %) in water	32 ml	l
35	aqueous 4 % solution of formaldehyde	10 ml	ł

3. Coating composition of the rear mordanting layer

## [0168]

gelatin aqueous dispersion of yellow IRIODINE 9231 (tradename) containing 30 % of yellow pigment and 8 %	of 100 g
gelatin mordant M (20 % solution)	250 ml
saponine (12 %) and wetting agent W (5 %) in water	32 ml
aqueous 4 % solution of formaldehyde	10 ml

[0169] The coating composition was applied at a dry coverage of 0.9 g/m² of getatin, and 1.3 g/m² of interference pigment.

# EXAMPLE 4

[0170] Example 3 was repeated with the difference that the light interference pigments were applied uniformly in a gelatin top cost covering the mordaning layer. The dried top cost contained 0.5 g/m² of gelatin and 1.3 g/m² of interference pigment at each side of the transparent support.

## Claims

- 1. A security document which contains at least one byer, a support, at least one image or pattern serving for identification purposes and at least one light interference pigment distributed uniformly or patternwise in or or at least one byer of said document, characterized in that said support is a transparent clear resin film support or such support containing small amounts of pigments or voids opacifying to some degree the support, with a visible light-blocking capacity less than 50 % and in that said document, by the presence of said light inference pigment, has at least in certain areas a different color when viewed with light transmitted by the document in comparison with light transmitted by the document in comparison.
- 2. Document according to claim 1, wherein said document contains mixtures of different light interference pigments.
- Document according to claim 1 or 2, wherein in said document different light interference pigments are present uniformly each in a different layer at opposite sides of said support.
- 4. Document according to claim 1 or 2, wherein in said document different interference pigments are present uniformly each in a different layer at opposite sides of said support and at least one of said layers has undermeith and/or on top a pattern containing common light-reflecting pigments and/or dyes having no light interference properties.
- Document according to claim 4, wherein said pattern has substantially the same color as the color seen in transmission mode or reflection mode of the light interference proments combined with said pattern.
  - Document according to claim 1 or 2, wherein pattern-wise printed interference pigments are present underneath
    and/or on top of a pattern containing common light-reflecting pigments and/or dyes having no light interference
    properties.
  - 7. Document according to claim 1-or 2, wherein a pattern of printed interference pigments is present underneath and/ or on top of a layer or support having a color substantially the same as the color of said pattern containing said interference pigments when seem in reflection or transmission mode.
  - Document according to claim 1 or 2, wherein printed information containing light interference pigments A having
    undermeath printed information containing normal light-absorbing and light-reflecting pigments R are present at
    one side of a transparent support TS and at the other side of said support acid normal pigments R are printed in
    a pattern being overprinted at least partly by a pattern containing light interference pigments B.
- 9. Document according to claim 1 or 2, wherein information containing light interference pigments A at one side of a transparent support TS is patternwise printed over (1) in common? light reflecting pigment pattern R1 of which the color is complementary to the color of said pigments A when seen with reflected light, (2) a pigment pattern comprising common? light reflecting pigments R1 indeed with colored fluorescent or phosphorescent pigments or dries R7, and at the other side of said support TS interference pigments B are printed over (1)? a metalic pigment (alturnitum or bronze pisteriest) pattern M, (2) a pattern comprising light reflecting pigments R2 having a color complementarity to the color of said pigments B when seen with reflected light, (2) a pattern comprising installing pigments M mixed with forumnon" light reflecting pigments R2 having a color complementarity to the color of said pigments B when seen with reflected light.
- Document according to any of the preceding claims, wherein said document contains a photographically obtained image or pattern.
- Document according to claim 10, wherein said photographically objected image or pattern is produced by means
  of developed photosensitive silver halide directly in a light-sensitive material itself or in a non-light-sensitive image
  receiving material.
- Document according claim 10, wherein said photographically obtained image or pattern is produced by means of a non-impact printing technique in which analog or digital input signats for controlling said printing stem from photosignats originating from a visible original.
  - 13. Document according to claim 10, wherein said pholographically produced image or pattern is formed by the silver sait diffusion transfer process in an image-receiving material containing an image receiving layer comprising de-

velopment nuclei.

- 14. Document according to claim 10, wherein said photographically produced image or pattern is formed by a dye diffusion transfer process in an image-receiving material containing a mordant for a dye transferred from an imagewise exposed and developed silver halder emulsion material.
- Document according according to any of the preceding claims, wherein said interference pigments are mica platelets coated with a metal oxide.
- Spectrument according to claim 15, wherein said metal oxide is selected from the group consisting of TiO<sub>2</sub>, ZrO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and Cr<sub>2</sub>O<sub>3</sub>.
- Document according to claim 15 or 16, wherein said platelets coated with said metal oxide have a second coating
  of carbon.
- Document according to any of claims 15 to 17, wherein said platelets have a largest surface diameter between 5 and 200 um.
- Document according to any of claims 15 to 18, wherein the thickness of said interference pigments is between 0.1
  and 0.6 um.
- Document according to any of the preceding claims, wherein said light interference pigments are present in said document in a coverage of 0.3 g/m² to 10 g/m².
- 21. Document according to any of the preceding claims, wherein said support has been coated directly by sputtering with a thin metal code layer or has been coated with said metal code layer or top of a coating or pattern of said light interference pignments and/or coating or pattern of light reflecting pignments having no light interference properties taking care that the thus coated metal code layer has substantially the same or color complementary to the color of said patternivies applied pignments.
  - 22. Document according to any of the preceding claims, wherein on the front and/or rear side of said support underneath and/or on top of uniformly or patternwise applied interference pigments a printed guilloche line pattern with rainbow effect is present, containing therefor light reflecting pigments showing that effect so as to have one or more of the rainbow colors the same as the normal or complementary color of said fight interference pigments.
  - Document according to claim 22, wherein one or more of the rainbow colors is obtained by printing metallic pigments.
- 24. Document according to claim 22, wherein fluorescent or phosphorescent pigments have been mixed with said light interference pigments and/or with said light reflecting pigments giving said rainbow effect to the guilloche pattern.
  - Document according to claim 22, wherein said rainbow effect is obtained by printing a transparent varnish loaded with a fluorescent or phosphorescent pigment.
- 5 26. Document according to claim 22, wherein (a) bi-fluorescent pipment(s) is (ann) inted with one of said light intelleding pigments and/or nitsed with said light interference pigments whereby when exposed to ultraviolet light said fluorescent pigment(s) show(s) light of two different wavelength ranges one of which is different to rib the wavelength range of the colors of said light reflecting and interference pigments when these are observed under visible light conditions and the other corresponds with the normal or complementary color of said interference pigments.
  - 27. Document according to any of the preceding claims, wherein a guilloche pattern with trainbow effect is printed in perfect see-through print register on the front and rear side of said support, and wherein the light reflecting pigments showing rathow effect printed a none saide have complementary policy with respect to the pigments printed, but have at one side a color the same as the normal color of said light interference pigments, and wherein parts of said guilloche pattern at either side cover at least partly a photograph or printed pattern or complete a printed pattern.
  - 28. Document according to any of the preceding claims, wherein said document contains printed patterns at least

partly covering each other and said potterns each contain (a) different light interference pigment(s) the construction and composition of which is such that they show a different color shift when viewed under the same observation angle, and wherein the printed pattern most remote from the observer has higher covering power than the pattern printed thereon which is more transparent, hereby obtaining a document that shows in the overlapping pattern area a continuously champing code with bly changing gradually the observation angle.

29. Document according to any of the preceding claims, wherein said document is in the form of a laminate.

## Patentansprüche

- 1. Ein Sicherheitodokument, das wenigstens eine Schielt, einen Träger, wenigstens ein zu Identifikationszwecken dienendes Bild oder Munter und wenigstens ein gleichmäßig der mustermäßig in oder auf wenigstens einer Schicht dieses Dokuments vereitles Lubtimisefererbrigment enbähl, daburch gekennzeichnet, daß der Träger ein durchsichtiger klarer Harzfilmfäger oder ein sochert, Meine Mengen den Träger einigermaßen höbenachende Pigmente oder Hohnitumen enthaltender Träger mit einer Lüchtundruchlissigkeit für sichtimens Licht kleiner als 50% kst, und dadurch, daß ab Dokument aufgrund der Einarbeitung des Lichtinierferenzpigments bei Betrachtung mit durch dass Dokument durchgelassenem Licht ihm Vergleich mit einer Betrachtung mit durch das Dokument mit betracht und versten den unterschließer har bei aufwichste Fabre aufweite.
- Dokument nach Anspruch 1, dadurch gekennzelchnet, daß das Dokument Mischungen aus verschiedenen Lichthiterferenzpigmenten enthält.
- Dokument nach Anspruch 1 oder 2, dadurch g\u00e9kennzeichnet, da\u00e4 in diesem Dokument verschiedene Lichtbterfererpigmente je gleichm\u00e4\u00e4ge in einer unterschiedlichen, an den gegen\u00fcberfiegenden Setten des Tr\u00e4gers befindlichen Schicht enthaften sind.
- 4. Dokument nach Anspruch 1 oder 2, dadurch gekennkalchnet, daß in diesem Dokument verschiedene Lichtinterferenzpigmente je gleichmäßig in einer unterschiedlichen, an den gegenüberliegenden Sallan des Trägers befindlichen Schicht einbalen sind in dereigstense eine dieser Schichten auf deren Unterselbe undöder Obersalle ein Muster mit üblichen lichtrefledterenden Pigmenten undöder Farbetoffen ohne Lichtinterferenzeigenschaften enhält.
- Dokument nach Anspruch 4, dadurch gekennzeichnet, daß das Muster wesentlich dieselbe Farbe hat wie die Farbe, die bei der Durchsicht- oder Aufsichibetrachtung der Lichtinterferenzpigmente in Kombination mit diesem Muster beobachtel wird.
- Dokument nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß unter und/oder auf einem Muster mit üblichen lichteflektierenden Pigmenten und/oder Farbstoffen ohne Lichtinterferenzeitgenschaften mustermäßig gedruckte Interferenzeitgenente enthalten sind.
- 7. Dokument nach Anspruch 1 oder 2, dadurch gekennzelichnet, daß unter undloder auf einer Schicht oder einem Träger ein Muster von gedruckten Interferenzpigmenten enthalten ist, wobel die Schicht bzw. der Träger bei Durchsicht- oder Aufstaltbetrachtung wesentlich dieselbe Farbe wie die Farbe des die Interferenzpigmente enthaltenden Musters aufwelst.
- 8. Dokument nach Anspruch 1 oder Z, Hadurris gekennzeichnet, daß gedruckte Information enthaltende Lichtineterferenzpigmente A, unter denen sich gedruckte Information enthaltende, normale, lichtabsorbierende und lichtreiteiterende. Pigmente R bei michen, auf einer Seite eines durchsichtigen Trägers TS enthalten sind und auf der anderen Seite des Trägers die normaten Pigmente R in einem wertigstens teilweise durch ein Lichtinterferenzpigmeine B erhalterietes Musiche Ordrucktem Musics podurckt werden.
- 9. Dokument nach Anspruch 1 oder 2., dadurch gekennzielchnet, daß Information enthaltende Lichtlinteforenzpigmente A auf einer Selte eines durchsichtigen Trägers TS mustermäßig über (1) einem Tüblicher lichterblichtierende Pigmente R tränslatenden Mussel, deren Farbe bei Musfalchtierbachung mit der Farbe der Pigmente A korrighementär ist, und (2) einem Pigmentmuster mit "üblichen" lichterblichtenden, mit gelächten fluoreszierenden oder phosphoreszierenden Pigmenten oder Farbstöfen FV remäschlare Pigmenten R1 gedruckt werden und auf der anderen Selte der Tägers TS Inderferenzpigmente B über (1) einem Melafleigmente (Aburnhaum oder Brozzs-

- platten) enthratlenden Musiter M, (2) einem Muster mit lichtreflektierenden Pigmenten R2, die bei Aufsichtbetrachtung eine mit der Farbe der Pigmente B komplementäre Farbe aufweisen, und (3) einem Musiter mit Metalbigimenten M, die mit "normalen" lichtreflektierenden Pigmenten R2, die bei Aufsichtbetrachtung eine mit der Farbe der Pigmente B komplementäre Farbe aufweisen, vermischt sind, gednuckt werden.
- Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß das Dokument ein fotografisch erhaltenes Bild oder Muster enthält.
- 11. Dokument nach Anspruch 10, dadurch gekenntzeichnet, daß das folografisch erhaltene Bild oder Muster unter Anwendung von enhöckeltem foloempfindlichem Silberhalogendi direkt in einem lichtempfindlichem Material seiber oder in einem lichtmempfindlichem Bildempfangsmaterial erzeugt wird.
- 12. Dokument nach Anspruch 10, darburch gekeinnzelchnet, daß das fotografisch erhaltene Bild oder Muster durch eine anschlagfele Drucklechnik, bei der analoge oder dighale, den Druckvorgang steuernde Eingangssignale von druch eine Schibzre Vorlage emtitlerten Fotosignalen stammen, erzeugt wird.
- 13. Dokument nach Anspruch 10, dadurch gekennzeitchnet, daß das fotografisch erzeugte Bild oder Muster gemäß dem Silbersalzüffüsionsübertragungsverfahren in einem Bildempfangsmatertal mit einer Entwicklungskeime enthaltenden Bildempfangsschicht erzeugt wird.
- 14. Dokument nach Anspruch 10, dadurch gekennzelichnet, daß das folografisch erzeugte Bild oder Muster entsprechend einem Farbstoffdinssonsübertragungsverfahren in einem Bildempflangsmaterial, das ein Beizmittel für einen ovon einem bildnäßig belichteten und entwickelten Silberhalogeniderneksinssnaterial übertragenen Fanbstoff enthält, erhalten wird.
- Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzelichnet, daß die interferenzpigmente mit einem Metalloxid überzogene Mikaplatten sind,

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- 16. Dokument nach Anspruch 15, dadurch gekennzeichnet, daß das Metalloxid TiO., ZrO., Fe.O. oder Cr.O. ist.
- 17. Dokument nach Anspruch 15 oder 16, dadurch gekennzelichnet, daß die mit dem Metalloxid überzogenen Plattich eine zweite, aus Kohlenstoff bestehende Schicht haben.
- Dokument nach irgendelnem der Ansprüche 15 bis 17, dadurch gekennzeichnet, daß der Höchstoberflächendurchmesser der Platten zwischen 5 und 200 µm liegt.
- Dokument nach irgendeinem der Ansprüche 15 bis 18, dadurch gekennzeichnet, daß die Stärke der Interferenzpigmente zwischen 0,1 und 0,6 µm liegt.
- Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Lichtinterferenzpigmente in einem Verhältnis zwischen 0,3 g/m² und 10 g/m² im Dokument enthalten sind.
  - 21. Dokument nach ingendeinem der vorsiehenden Ansprüche, daburch gelennzeichnet, daß der Tiligier einheuder direkt durch Aufstübern mit einer Offenen Metallosöchlich der den an diener Scheich oder einem Austrem den Lichtherferenzeignenten undfoder oben auf einer Scheich oder einem Muster mit lichterferenzeignenten undfoder oben auf einer Scheich oder einem Muster mit lichterferenzeignenten mit eine Heitenbotscheich der zegen hat, webei dem zur gezelbt werte, daß die so aufgetingenen Metallosöchschich dieselbe Farbe wir die Farbe der mustermäßig angebrachten Pigmente oder eine durch komplementifier Farbe aufweist.
- 22. Dokument nach Igendehem der vorstehenden Ansprüche, dadurch gekennzalehnet, das Sich an der Vordesselle untdere der Büdsen der ein Begreunder der Büdsen der möder auf gleichnet Büd gedergenem historienzugieren ein gedrucktes Güllüchebrichmuster mit Regenbogsenfeld befindet, wobei dieses Muste zum Erhalt dieses Effekts birderbeitferunde, den Regenbogsenfeld sehrindet aufweisende Pigmene enthält, so daß eine oder mehr Regenbogsenfeld untweisende Pigmene enthält, so daß eine oder mehr Regenbogsenfalten dieses Bedes birderbeitferunde, den Regenbogsenfalte untweisende Pigmene enthält, so daß eine oder mehr Regenbogsenfalten dieses Bedes birderbeitferunde, der sehre der Lichtinierferungstigmente.
  - Dokument nach Anspruch 22, dadurch gekennzelichnet, daß eine oder mehr Regenbogenfarben durch Aufdrukken von Metallpigmenten erhalten werden.

- Dokument nach Anspruch 22, dadurch gekennzeichnet, daß fluoreszierende oder phosphoreszierende Pigmente mit den Lichtinterferenzpigmenten undfoder den führteflektierenden Pigmenten vermischt sind und dem Guillochemuster dadurch den Beoenbooeneffelt verteilben.
- Dokument nach Anspruch 22, dadurch gekennzelchnet, daß der Regenbogeneffekt durch Aufdrucken eines durchsichtigen, mit einem fluoreszierenden oder phosphoreszierenden Pigment geladenen Lacks erhalten wird.
  - 28. Dolument nach Ausprund 22, darburch gekennzelchnet, daß (ein) bilbuorszierende(e) Pigment(e) mit einem der lichterleitdierenden Pigmente und/oder mit den Lichterleiterenzpigmenten vermischt ist (sind), wobei das (die) Floreszenzpigment(e) bei Beichtung mit Uhravoleitlächt Licht von zwei unterschiedlichen Weltenbereichen auf weist (aufweisen), von denen sich einer bei Betrachtung unter sichbaren Licht der ichtreitlichterenden Pigmente und Lichtlichterenzpigmente wem Weltenbereich er Farben der Ichtreitlichterenden Pigmente und Lichtlichterenzpigmente und Lichtlichterenzpigmente
  - 27. Dokument nach Irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß ein Gr

    üllicher Begenbogeneffelt in perfektem Durchstchthuckregister auf der Vorderseite um R

    ückseite des Tr

    giers gedruckt wird, die an einer Selle gefundten, furthertalleternende, nen Reprendposteffelt aufwissenden Pigmentel
    eine mit der Farbe der gedruckten Pigmente komplement

    füre Farbe, aber auf einer Selle eine der normalen Farbe
    der Ubf\(\text{interferverziginnen\text{lenen}\) eine eine Gelten Sellen
    wentsetens leitweise den Lichtbild der gedrucktes Naters bedechen der in gedrucktes Nater vervolst\(\text{and}\) eine
    wentsetens leitweise den Lichtbild der gedrucktes Naters bedechen oder in gedrucktes Nater vervolst\(\text{and}\) eine
- 28. Dokument nach Irgandeinem der vorstehenden Ausprüche, dadurch gekenszeichnet, daß das Dokument gegendunden Nuster, die werigstens belweise einander bedecken, und pleed sieser Nutzer (ein) unterscheiden, Lichtinserferenzpisenent(e) erthält, das (die) so strukturiert und zusammengsestet ist (sind), daß es (sie) bei Betrachting unter demassbeh Bebochultungswicht eine unterscheidender Fertverscheidung aufweist (aufweis), und daß das ein weltsstein vom Beobachtungswicht ein beitre unterscheidungs aufweist (aufweische Weist auf daß das ein weltsstein vom Beobachter ernfernt Repende gedruckte Muster ein höheres Deckvernögen aufweist aufweist auf vom Beobachtungswichte Problement, Die dem unter stufferweise Anderung des Beobachtungswinkeits mit übertappenden Musterbereich eine sich umuntertrochen indermde Farbverscheidung der federe ist Weist auf vom der Vertragen vom den vertragen vom der Vertragen
  - Dokument nach irgendeinem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß das Dokument in Form eines Laminats vorliegt.

#### Revendications

- 1. Un document de sécurité qui confient au moiss une couche, un support, au moiss une image ou un moit seriont à des fins d'écheffication, un moiss une glorant d'intérférence tambisses distribus unterminent ou sous forme de moit dans ou sur au moiss une couche de ce document, ciractérisé én ne que ce support est un support du mit fin de n'étére drair ou la les support contenunt de petites quantitée de pignemes ou de porse sposifiant le support à un certain dégré et possédant une capacité de blocage de lumiter visible inférieura à 50 %, et en ce que ce document, suite à la présence de ce pigneme d'étairéféreux hantieux, posséda ou moite dans certaines zones une couleur différente le cargorin fobserve à la lumière transmise par le document par rapport à broqu'en fobserve à la lumière transmise par le document par rapport à broqu'en fobserve à la lumière transmise par le document.
- Document selon la revendication 1, caractérisé en ce qu'il contient des mélanges de différents pigments d'interlérence lumineuse.
- 3. Document selon la revendication 1 ou 2, caractérisé en ce que dans ce document différents pigments d'interférence lumineuse sont chacun présents de manière uniforme dans une couche différente des côlés opposés du support.
- 4. Document sebo la revendication 1 o u2, caractérisé en ce que dans ce document différents pipments d'haterisrens eon chacum précents de manière uniforme dans une couche différent des ciblés coposes du support en un moins une de ces couches a au-dessous et/ou au-dessus un moit contenant des pigments et/ou colorants ordinaire stifférichsant la fumilier e d exempts de provoltés d'interférence humineuse,

- Document selon la revendication 4, caractérisé en ce que ce motif a essentiellement la même couleur que la couleur vue en transmission ou en réflexion des pigments d'interférence lumineuse combinés avec ledit motif,
- Document seón la revendication 1 ou 2, caractérisé en ce que les pigments d'interférence imprimés sous forme de moilf sont présents au-dessous et/ou au-dessous d'un moilf contenant des pigments et/ou colorants ordinaires réfléchissant la lumière et exempts de propriétée d'interférence lumineuse.
- 7. Document selon la revendication 1 ou 2, caractérisé en ce qu'un motif de pigments d'interférence imprimés est présent au-dessous ellou au-dessus d'une couche ou d'un support possédant essentiélement la même couleur que la couleur dudit motif contenant les pigments d'interférence loriqu'en l'observe en réflexion ou en transmission.
- 8. Document selon la revendication 1 ou 2, caractérisé en ce que de l'information imprinée contenant les pignents d'interférence lumineuse A su-dessous de laquelle est imprinée de l'information contenant des pignents ordinaires R absorbant et réfédichisain la hamière est présente sur un côté d'un support transparent 175 est sur l'autre côté de ce support lesetits pignents driffaires R sont imprinés dans un motif qui est surimprimé au moins partiellement par un motif contenant des pignents d'interférence lumineuse B.
- 9. Document seko la revendication 1 ou 2, caracteristé en ca que de Information contenant des pignents d'intertérence lumineuse A sur un côté d'un support transparent 15 est imprimée a sus forme de moit au dessus (1) d'un moit IR 1 de pignent fordinaire rédéchissant la hamière port la couleur est complémentaire à la couleur desdis pignents A lorsqu'on les observé à la unistre infélachie, (2) d'un moit de pignent comprenent des pignents d'uniteris PT infélichies nals la lamière et mélantegé avec des coloraiss su pignents for coloris fluorescents ou phosphorescens, et sur l'autre côté dudit support 15 des pignents d'interférence 8 sont imprimés au dessus (3) d'un moit de pignent de l'autre de
- Document selon l'une quelconque des revendications précédentes, caractérisé en ce qu'il contient une image ou un motif obtenu(e) par vote photographique.
  - 11. Document selon la revendication 10, caractérisé en ce que cette image ou ce motif obtenu(e) par vole photographique est produit(e) au moyen d'un haiogénure d'argent photoseasité développé directement dans un matériau sensible à la lumière ou d'ans un matériau récopteur d'image no-censible à la lumière.
  - 1.2. Document selon la revendication 10, caractérisé en ce que celte linsque ou ca motif obtenuje) par voie photographique est produtilej o un royen drune technique dumpression sans impact dans laquelle des signaux dreite digitaux ou analogues pour commander cette împression proviennent de photosignaux provenant d'un original visible.
  - 13. Document seion la revendication 10, caractérisé en ce que cette image ou ce motif produit(e) par voie photographique est formé(e) par le procédé de transfert de sel d'argent par d'iffusion dans un matériau récepteur d'image contenant une couche réception d'image comprenent des remes de d'évelopement.
  - 14. Document selon la revendication 10, caractérisé en ce que cette image ou ce motif produit(e) par voie photographique est formé(e) par un procédé de transfert de colorant par diffusion dans un malérieu récepteur d'image contenant un mordant pour un colorant transféré à partir d'un matérieu d'émulsion à l'halogénure d'argent exposé et développé sous forme d'image.
  - 15. Document selon fune quelconque des revendications précédentes, caractérisé en ce que les pigments d'interférence sont des paillettes mica enduites d'un oxyde métallique.
- Document selon la revendication 15, caractérisé en ce que l'oxyde métallique est choisi parmi TiO<sub>2</sub>, ZrO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>
   et Cr<sub>2</sub>O<sub>3</sub>.
  - 17. Document selon la revendication 15 ou 16, caractérisé en ce que les palitettes enduites de l'oxyde métallique sont recouvertes d'une deuxième couche de carbone.

- Document selon l'une quelconque des revendications 15 à 17, caractérisé en ce que les paillettes ont un diamètre de surface maximal entre 5 et 200 µm.
- Document selon l'une quelconque des revendications 15 à 18, caractérisé en ce que l'épaisseur des pigments d'interférence se situe entre 0,1 et 0,6 μm.
- 20. Document selon l'une quelconque des revendications précédentes, caractérisé en ce que les pigments d'interférence lumineuse sont présents dans ce document à raison de 0.3 g/m² à 10 g/m².
- 21. Document selon l'une quelconque des reverdications précédentes, caractérisé en ce que le support a été enduit directement par pubérisation carbodique d'une mince ocuche d'oryée métallique au dessus d'une notific ou moit de coulcit de soit s'entre finance au mineuxe et eleu d'un envoit une moit de pigments réféchessant la bunière ne possédant pas de propriété d'interférence hamineuxe, veillant à ce que la couche d'oxyée métallique au les aprighée ait essentiellement la même couleur ou une couleur complémentaire à celle des pigments appliqués sous forme de moit.
- 22. Document selon l'une quelconque des revendications précédentes, caractérisé en ce que sur le front étou le dos duit support au-dessous elles aux-dessous des pignents d'interference appliqué uniformément ou sous forme de modif set présent un motif en lignes guillochées avec effet au «n-céel qui confier à cette fin des pignents réfédérissant la humière procurant cet éfet de sorte qu'han ou plasteurs des couleurs arc-en-ciel sont licentiques à la couleur nomale ou complémentaire des pignents d'interference humineuse.
- 23. Document selon la revendication 22, caractérisé en ce qu'un ou plusieurs des couleurs arc-en-ciel sont obtenus en imprimant des pigments métalliques.
- 24. Document selon la revendication 22, caractérisé en ce que des pigments fluorescents ou phosphorescents ont été métangés avec lesdits pigments d'interférence humineuse ét/ou avec lesdits pigments réfléchissant la humière procurant ou el feta aro-a-ci et un motif guitore.
- 25. Document selon la revendication 22, caractérisé en ce que l'effet arc-en-ciel est obtenu en impriment un vernis transparent chargé d'un pigment fluorescent ou phosphorescent.
  - 28. Document selon la revendication 22, caractérisé en ce qu'un ou plusieurs pigments bi-fluoresconts soint mélangés avec un des pigments diffichissant la lumière el/ou mélangés avec les pigments d'interférence lumièreus, celo pigment(s) fluorescent(s) montain losqu'il(e) est loroit exposé(s) és à lumière utraviolète de la humière de deux domaines de longueur d'onde différents dont fluo est différent du domaine de longueur d'onde des couleurs desdits pigments d'interférence et réflichéssant la lumière lorsqu'on les observes sous des conditions de lumière visible et l'autre correspond à cheti de la couleur normale ou complémentaire desdits pigments d'interférence.
- 27. Document seion l'une quelconqué des revendications précédentes, caractérisé en ce qu'un moit guilloché avec effet aro-ca-cèl est imprimé en parfait registre d'impression translacide sur le front et le cos dudit support, et des caractérisés en ce que se prignents réflécissant la huntére présentant fotel aro-en-cicle et imprimés sur un côté possiblent une couleur complémentaire per rapport sux pignents imprimés, unais possiblent sur un côté une couleur des complexes à couleur romais desdits lightenest d'intérféreures bunineuse, et caractérisé en ce que des parties dudit moit guilloché sur chaque côté reconvent au moins partiellement une photo ou un moit imprimé ou consolitent un moit l'imprimé ou consolitent que moit partier des consolitent que moit l'imprimé ou consolitent un moit l'imprimé ou consolitent que moit l'imprimé ou consolitent un moit l'imprimé ou consolitent que moit l'imprimé ou consolitent que moit l'imprimé ou consolitent un moit l'imprimé ou consolitent de moit l'imprimé ou consolitent que moit l'imprimé ou consolitent que moit l'imprimé ou consolitent de moit l'imprimé ou consolitent que moit l'imprimés que de l'imprimés que l'imprimés que moit l'imprimés que l'imprimés que de l'imprimés que l'im
  - 23. Document selon Tune quelconque des revendications précédentes, caractéritée en ce que ce document contient des moitres proches se chorauchant au moine partiellement et chaque moit confeire un piu plautieurs piernest d'interfirence lumineuse différents dont la construction et la composition sont telles que les pignents présentent un changement de couleur différent lorsigir on les observes outs in même ample d'observation, et accusaciféré en ce que le moit împriné qui et les l'épus déloginé de l'observatieur a un pouvir couvrant plus élevé que le moit impriné là-dessus qui est plus técnique de l'observatieur a un pouvir couvrant plus élevé que le moit impriné là-dessus qui est plus temps parent, obterant de cotte monitére un document qui présente dans la zone de chrevauchement du moit fun chaquement constant de la codure un chaquent graduellement l'ample d'observation.
  - 29. Document selon l'une quelconque des revendications précédentes, caractérisé en ce qu'il est sous forme de

